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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in the following list:—

1925	
Sept. 19–28	F.I.A. Conference at Prague.
Sept. 27–Oct. 7	"On to New York" Contest.
Sept. 27–Oct. 10	American "National Aviation Meet," Mitchel Field, Long Island, N.Y.
Sept. 28	Ford Trophy, Detroit, U.S.A.
Oct. 1	Maj.-Gen. Sir Sefton Brancker, K.C.B., A.F.C. "The Technical Lesson of Five Years of Air Transport," before R.Ae.S.
Oct. 8	Aero Golfing Soc. Autumn Meeting, Walton Heath.
Oct. 10	Pulitzer Trophy, Long Island, U.S.A.
Oct. 15	Maj. C. K. Cochran-Patrick, D.S.O., M.C. "Aircraft Survey in Burma," before R.Ae.S.
Oct. 24–29	Schneider Cup Race, Baltimore, U.S.A.
Oct. 29	Mr. W. L. Cowley. "Aircraft Transport Economy," before R.Ae.S.
Nov. 3	Sir Dugald Clerk, K.B.E., F.R.S., D.Sc., M.I.M.E., M.I.C.E., F.R.Ae.S. "Supercharging," before R.Ae.S.

EDITORIAL COMMENT.

"SCRAP the lot!" is a slogan that has been used in various connections in recent years, and not infrequently it has been applied to airships; nor was it to be expected that the recent calamity in the United States, which resulted in the loss of the rigid airship "Shenandoah," with a number of valuable lives, would prove an exception, and the catastrophe has been made the occasion in certain quarters, not only in this country but throughout the world, for advancing the claim that airships never have been and never will be any use.

Airships

This is, perhaps, only natural, and in the grief and bitterness accompanying the loss of valuable lives, and in many cases personal friends, one is frequently apt to denounce as dangerous and futile the immediate cause of the catastrophe. It was so in Germany after the losses of some of the earlier Zeppelin airships. It was so in Great Britain, and, to some extent, in the United States, after the loss of the R.38. It was so in France after the disappearance without trace of the French airship "Dixmude"; and it is so after the most recent regrettable loss of the "Shenandoah." Yet if one examines dispassionately the facts in so far as they have at present become known, there is nothing whatever in the accident to damn airships as such.

Briefly, the facts, or such of the facts as have hitherto come to light, are that the United States airship "Shenandoah," proceeding on a cruise to the Middle West, was caught in a thunderstorm and broke her structure in the air. This much, at any rate, can be accepted as actual fact. There has never yet been an airship accident but that some one or other has alleged some omission or negligence on the part of those responsible for the construction or equipment of the airship. Something of the sort happened after the "Dixmude" disaster, and when the R.38 broke up and fell into the Humber a number of rumours were circulating, most of them wholly

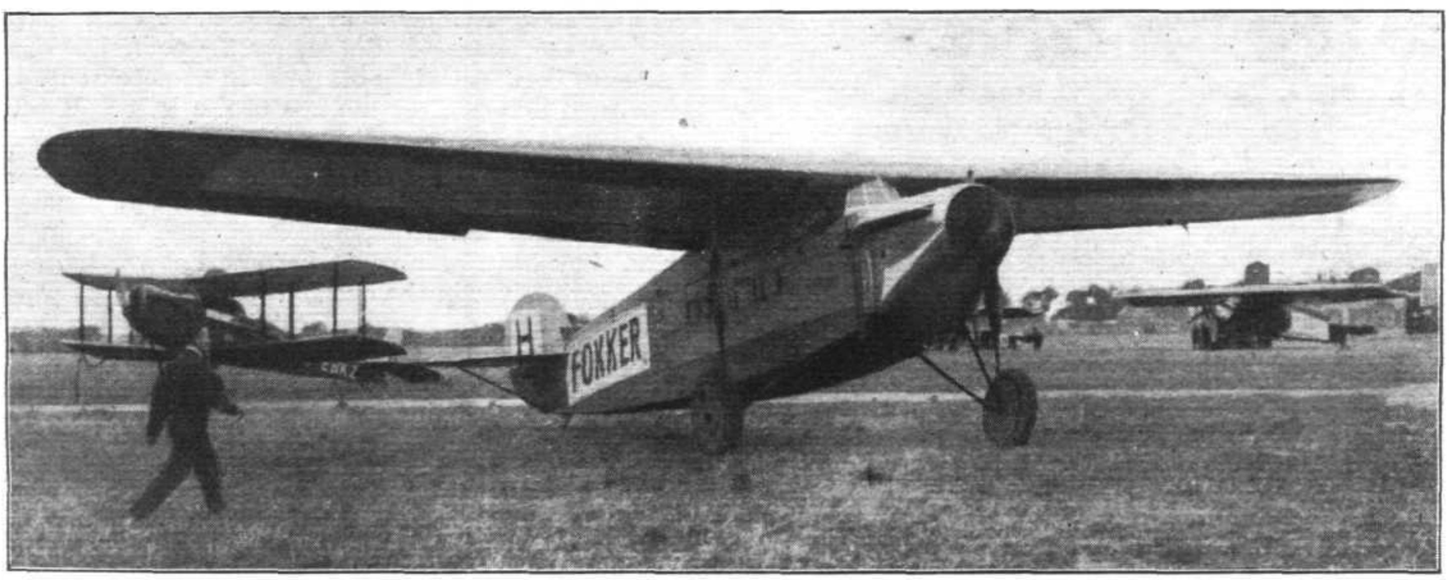
without foundation. In consequence, one has now come to expect these allegations after the event, but it is somewhat curious that the criticisms are never made, or are not given prominence, beforehand. In the case of the "Shenandoah" the statement has been made that, in order to economise the precious helium gas, some of the valves had been taken out, and that when the airship was caught in the violent currents and rose rapidly, the valve areas were insufficient to allow of the gas being valved rapidly enough, with the result that the ballonnets expanded and, either by themselves or in connection with external stresses set up by the buffeting which the ship received from the air currents, broke the structure in half.

Naturally we are not in a position to know if this allegation is based on fact, but, even accepting it as correct, the catastrophe can scarcely be blamed on the airship itself. Whether or not the "Shenandoah" would have weathered the storm had the crew been able to release the gas pressure sufficiently quickly (accepting the reduced valves statement) does not greatly affect the argument. The one fact which seems to stand out is not whether the airship should be capable of surviving a severe thunderstorm, but that she ought never to have been in the storm. This is precisely one of the claims made by airship advocates, that with good meteorological information available an airship should be able to avoid a storm, and, so far from a storm presenting a risk, it may, by skilful navigation, be made to assist the airship in its progress. This was the case, for instance, when the Z.R.3 crossed the Atlantic not very long ago. Dr. Eckener, the famous German airship pilot, received meteorological information from ships stationed along the route, and was able to take a slightly different course in order to get into a favourable air current, which actually added many miles an hour to the speed of the airship.

We do not say that in the particular case of the "Shenandoah" it would have been possible to avoid the storm. These disturbances have a habit of springing up very suddenly in some of the States, and it is possible that until a much more extensive meteorological service is available than at present, the storm which wrecked the "Shenandoah" could not have been predicted. At the same time, the advocates of airships and airship services are justified in claiming that no commercial airship service will or should be established until a very complete chain of meteorological stations has been provided, and that when this is done an airship running on a regular route should never be caught in a storm severe enough to represent a real danger.

This much having been conceded, it must be admitted that the accident gives food for thought, and no pains must be spared, nor time or expense, to make certain that in so far as is humanly possible everything that can be learned shall be learned from the experiments with the R.33 before the construction of large airships is commenced. Even if these experiments should delay the construction of the new five-million cubic feet airships for a couple of years, that would be infinitely preferable to forcing the work on the larger ships, only to find at a later date that there was some fundamental defect in the design. What it practically amounts to is that we have to start all over again, checking step by step in the design by the most thorough tests in wind tunnels, in actual flight with the existing airships, and by tests on various girders. The process will naturally be a laborious one, but if we mean to carry on with airship development the tedious work is unavoidable, nor should the price be grudged.

From this country the deepest sympathy will go out to our cousins on the other side; first and foremost to the personal relatives of those who gave their lives in the cause of progress, and also to the American aviation community, and the American nation in their grievous loss. Great Britain has suffered a similar or even worse bereavement, and can therefore appreciate what such a calamity means. We refuse to believe that the loss of the "Shenandoah," regrettable as it is, will result in the abandonment of airship work in this country, nor do we think that our American friends, when they have had time to consider all the facts, will put a full stop to their airship research. The Americans are not quitters, nor do we for one moment believe that the American nation will let itself be deterred from doing its share in the development of the world's airship work.



ANOTHER DUTCH WORLD'S RECORD: This photograph shows the latest Fokker F.VII commercial aeroplane, with 400 h.p. "Liberty" engine, on which the Fokker pilot, Grase, established, on July 27, a world's record for duration, with a useful load of 1,500 kgs. (3,300 lbs.), by flying for 3 hours 3½ mins. This flight has been recognised by the F.A.I. as a world's record, and also beats the world's duration record for useful load of 1,000 kgs. The previous world's records were held by Lieut. J. A. McReady, of the U.S. Air Service, with 2 hours 14 mins.

THE ITALIAN N.2 SEMI-RIGID AIRSHIP

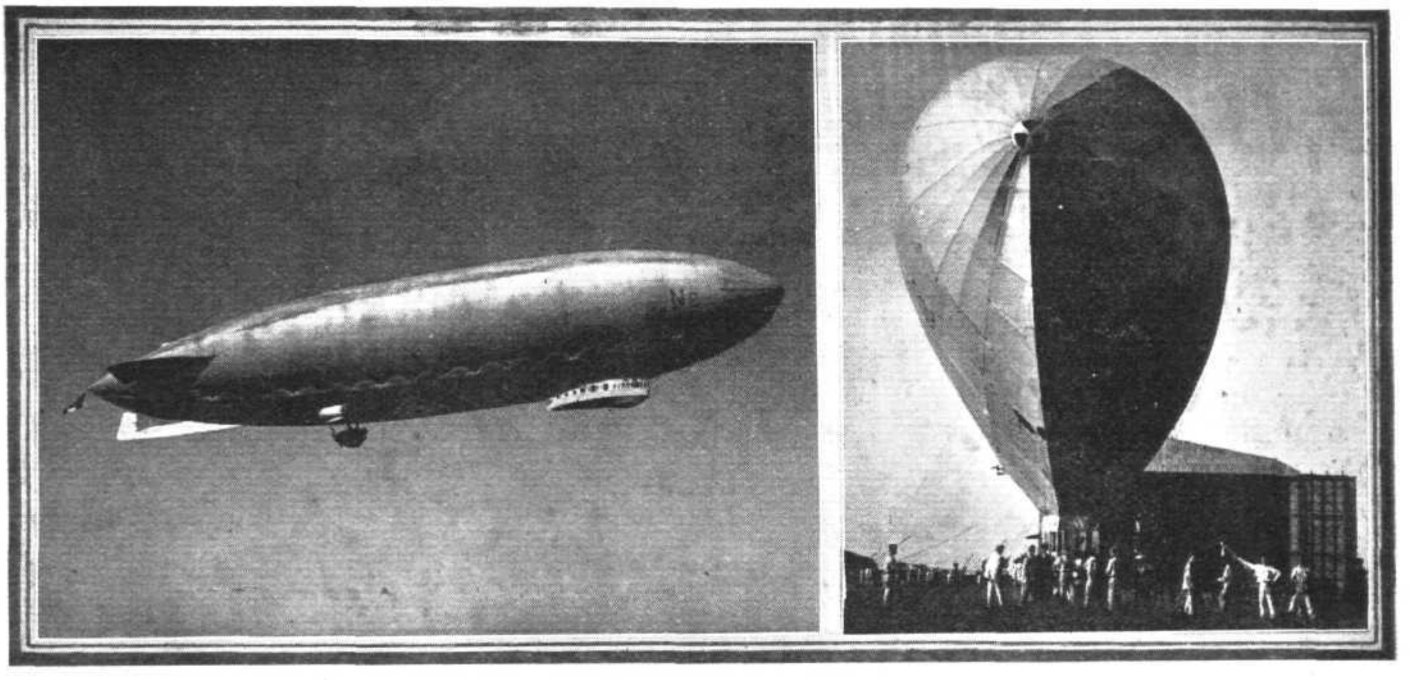
WE are able this week, through the courtesy of General A. Guidoni, Italian Air Attache in London, to give some particulars and illustrations of the latest Italian semi-rigid airship, the N.2, which has been produced by the Government Airship Construction Establishment, and which made its first trials early in July last. The continued progress of Italian airship design and construction leads one to anticipate complete success in respect of the N 53,000 cub. m. airship, which is at present in course of construction at the Government factory in Rome, and which, it is claimed, will be the largest semi-rigid airship ever built. In designing this latter airship, Engineer Nobile decided to introduce a number of substantial modifications in the structure with respect to previous types, and it was in order to acquire the necessary practical experience that the N.2 was built. This new airship, the N.2, is similar in some respects, although of reduced volume, to the N.1—which was fully described in FLIGHT for March 20, 1924—but embodying a number of rational improvements, eliminating certain imperfections and correcting some minor defects. These modifications are, in some cases, of great importance, while in other cases they consist of differences in detail only.

The N.1 already represented a vast step forward in airship design. However, a further improvement has been attained in the construction of the N.2 by adopting a profile for the envelope of more pronounced elongation, and better streamline form. The new profile was attained from that of the N.1 by inserting a central cylindrical section, and by adopting for the stern a pronounced conical shape instead of the rounded-up stern in the N.1. A single internal catenary maintains the cross section of the envelope practically circular in shape. Thus the pear shape of the envelope in the case of the N.1 is appreciably reduced, resulting in a better distribution of stresses over the envelope. The gas chamber is subdivided into seven compartments, of about 1,000 cub. m. capacity each, by means of six diaphrams.

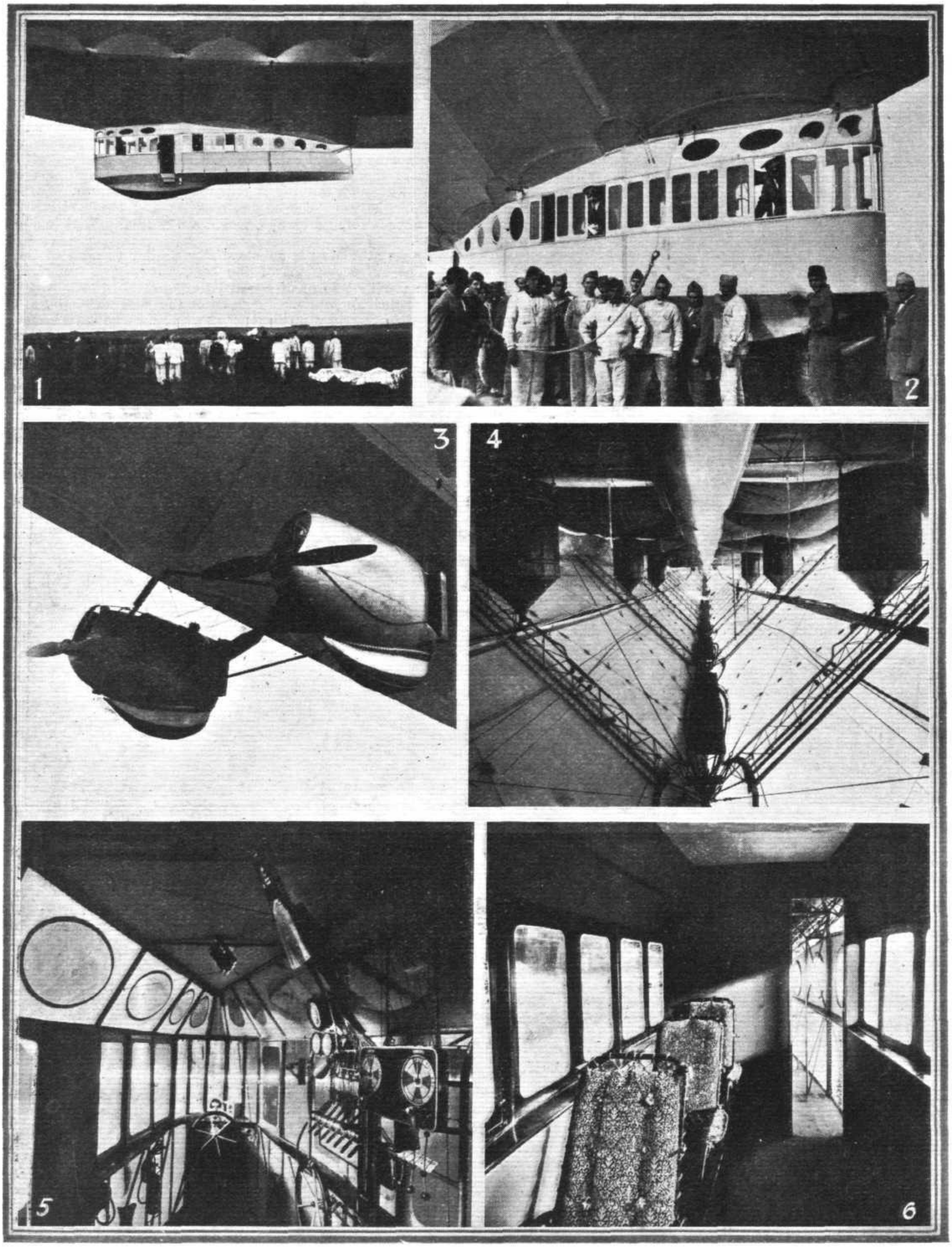
The main control car is located at the prow of the airship, 13·88 m. behind the nose. Visability is thus excellent, even for the second observation post located in the rear part of the car. It is roomy and very comfortable for the navigating personnel, and includes a wireless station and a lavatory. A passage leads from the control car to the gangway or catwalk, inside the keel of the airship, running the entire length, from prow to stern, which accommodates the various petrol and water balanced tanks, as well as landing ropes, etc. A vertical well through the envelope gives access from the keel to the upper part of the envelope.

Two engine nacelles are employed on the N.2 located 46 metres from the extreme nose of the ship, parallel to the longitudinal axis of the hull. These nacelles are very well streamlined, and are comfortable for the mechanics. Each nacelle contains an Isotta-Fraschini V.6 engine of 250 h.p., and the engine radiator is mounted outside, so that the hot stream of air from the radiator does not enter the engine compartment during flight, thus eliminating discomfort to the mechanic. The engine nacelles are sustained from the keel by means of steel cables only. They are equipped with pneumatic shock absorbers so that the danger of damage in case of a rough landing is reduced to a minimum. Communication between the engine nacelles and the keel is by means of movable gangways, which are normally kept inside the keel.

The nose stiffening is substantially similar to that of the N.1. The extreme point of the keel, however, is not rigid like the previous form of construction, but is connected by means of flexible joints. The ribs of the nose stiffening are also flexible, thereby facilitating assembly. The empennage consists of cruciform horizontal and vertical fins with elevators and rudder. The construction of the fins is similar to that obtaining in the case of the N.1, but much lighter. The horizontal fins are strengthened at their periphery by means of a very thin steel girder. However, the empennage as a whole is substantially different from that of the N.1. In fact, the complex stiffening consisting of longitudinal ribs and transverse rims has been completely eliminated, this form of construction having proved to be unsatisfactory because it adapted itself very badly to the deformations of the envelope caused by the high internal pressure, and by the stretching of the fabric. The horizontal fins of the new empennage are supported by a flat frame work projecting from the keel of the airship and corresponding with two consecutive triangular sections of the keel itself. The horizontal fins, consequently, transfer the forces to which they are subject, during flight, directly to the keel. The horizontal fins are stiffened on the outside of the envelope by streamlined struts only. This construction makes for a considerable lightening of stern as a whole, and possesses the great advantage that the fins are not subject to any displacement with respect to the keel on account of the deformation of the envelope. This arrangement of the fins has already been tested out in the "MR" dirigible, the smallest semi-rigid in the world (described in FLIGHT for September 4, 1924). It has, however, been necessary to test it again in a slightly larger airship before it can definitely be adapted for the new 53,000 cub. m. airship. Results of tests, so far, seem to be conclusive, and eliminate any doubt as to the success of this arrangement.



THE ITALIAN "N.2" SEMI-RIGID AIRSHIP: The latest airship produced at the Italian Government Airship Construction Establishment for the purpose of trying out certain modifications to be embodied in a 53,000 cub. m. semi-rigid now under construction. Our pictures show (left) the airship in flight, and (right) a front view at rest.



THE ITALIAN "N.2" SEMI-RIGID AIRSHIP: 1 and 2, close-up views of the main control car, which is attached direct to the flexible keel of the ship. (3) The two-engine nacelles, each containing a 250 h.p. Isotta-Fraschini V.6 engine suspended from the keel by cables. (4) A view inside the keel, or "catwalk," looking aft. (5) An internal view of the navigating section of the main car. (6) The "lounge" of the main car, which occupies the middle portion of the main car.

A number of other improvements have been introduced in the N.2 as, for example, the pneumatic control of the gas valves, which has already demonstrated in practice its importance and utility; the adoption of hand-operated valves, of minimum weight, for the outlet of air from the compensation chamber; finally, the installation of a rigid ladder in the well giving access to the top of the envelope from the keel of the ship.

The following are the principle characteristics of the N.2 :—
Volume, 7,000 cu. m. (247,000 cub. ft.).
Total length, 62·28 metres (270 ft.).
Average diameter, 12·80 metres (41·98 ft.).
Maximum height, 17·10 metres (55·08 ft.).
Maximum width, 12·80 metres (41·98 ft.).
Power plant, 2 Isotta-Fraschini V.6, 250 h.p. each.
Speed, full throttle, 120 km./hr. (74·5 m./hr.).
Cruising speed, 75 km./hr. (46·6 m./hr.).
Normal speed, 90 km./hr. (56 m./hr.).
Own weight, 4,700 kg. (10·340 lb.).
Crew, seven persons.
Endurance—
At 76 km./hr., 26 hours; 2,000 km. (1,242 miles).
At 90 km./hr., 15 hours; 1,350 km. (837 miles).
At 100 km./hr., 11½ hours; 1,150 km. (713 miles).

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San Francisco-Honolulu Flight Fails

ON August 31 two U.S. Navy PN-9 twin-engined flying-boats left San Francisco at 2.42 p.m. (Pacific time) for a 2,000-mile flight to Honolulu, Hawaii. At the time of the start weather conditions were ideal. One of the machines (Lieut. A. P. Snody in command), however, came down after having flown a distance of about 300 miles. The destroyer *William Jones* later located the flying boat, and took it in tow. It appears that the oil pressure lines of both engines had broken. Meanwhile the other machine—PN-9 No. 1, with Comdr. John Roders in charge—was making good progress, having been reported seen by the destroyer *Doyen*, stationed over half-way to Honolulu, 13 hrs. 37 mins. after having left San Francisco. Later, news was received that the machine was forced to descend, owing to adverse weather conditions and lack of fuel, some 150 miles from Manii Island at about 1.45 p.m., September 1. Naval craft in the vicinity immediately set out to search for the machine, but without result, darkness and mist hampering their efforts. Up to the time of writing nothing more has been seen of the flying boat with its crew of five, although on the evening of September 3 a wireless message was received from the s.s. *Whippoorwill* stating that flares had been seen in the Kauai Channel, and sea- and air-craft are still making every effort to find the missing flying-boat. A third machine—a Boeing PB-1 twin-engined flying-boat—which was to have followed the first two machines, was ordered by Mr. Wilbur, Secretary for the Navy, not to proceed.

French Seaplane Crews missing

UP to the time of going to press there is no news of the crews of the two French seaplanes missing since September 5, and there is now, unfortunately, but small hope that they are safe. The two machines were taking part in the French competition for commercial seaplanes, and both had alighted at Ajaccio, Corsica, to effect repairs, and had left again on the return journey to St. Raphaël, their starting point. One machine is a Schreck F.B.A., which was piloted by Laporte, who had with him the mechanics Granier and Sampite. The other is a Villiers, which was piloted by Priol, who was accompanied by his mechanic Durameau. Of Laporte and his crew there has been no news except that the Schreck was seen, from another seaplane taking part in the competition, flying considerably to the east of his proper course, as if he was making for the coast in order to alight. From Priol a pigeon message was received at St. Raphaël, stating that he was down some 20 miles from the coast. Searches by vessels have revealed no trace of the missing fliers, nor have search parties organised in Corsica been successful. It is thought that there is still hope that all may be safe.

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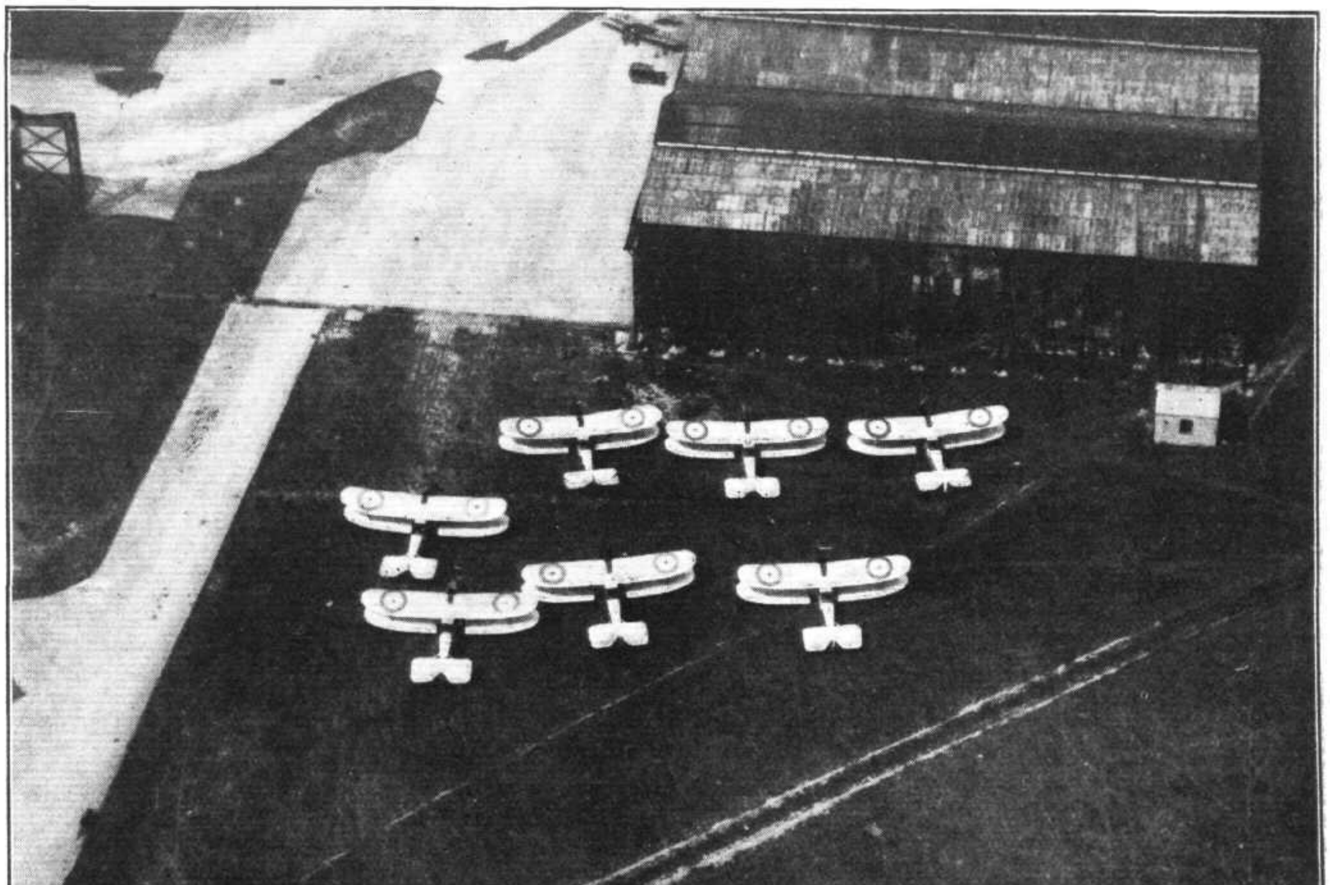


"BISONS" BROWSING AT BROUGH: This photograph, taken from the air, shows a fleet of Avro "Bison" machines at the Brough aerodrome. The "Bison" was designed and constructed by A. V. Roe and Co. as a Fleet gunnery spotter, and is fitted with a Napier "Lion" engine. The machine is equipped for taking off from, and alighting on, the deck of a vessel.

THE "SHENANDOAH" DISASTER

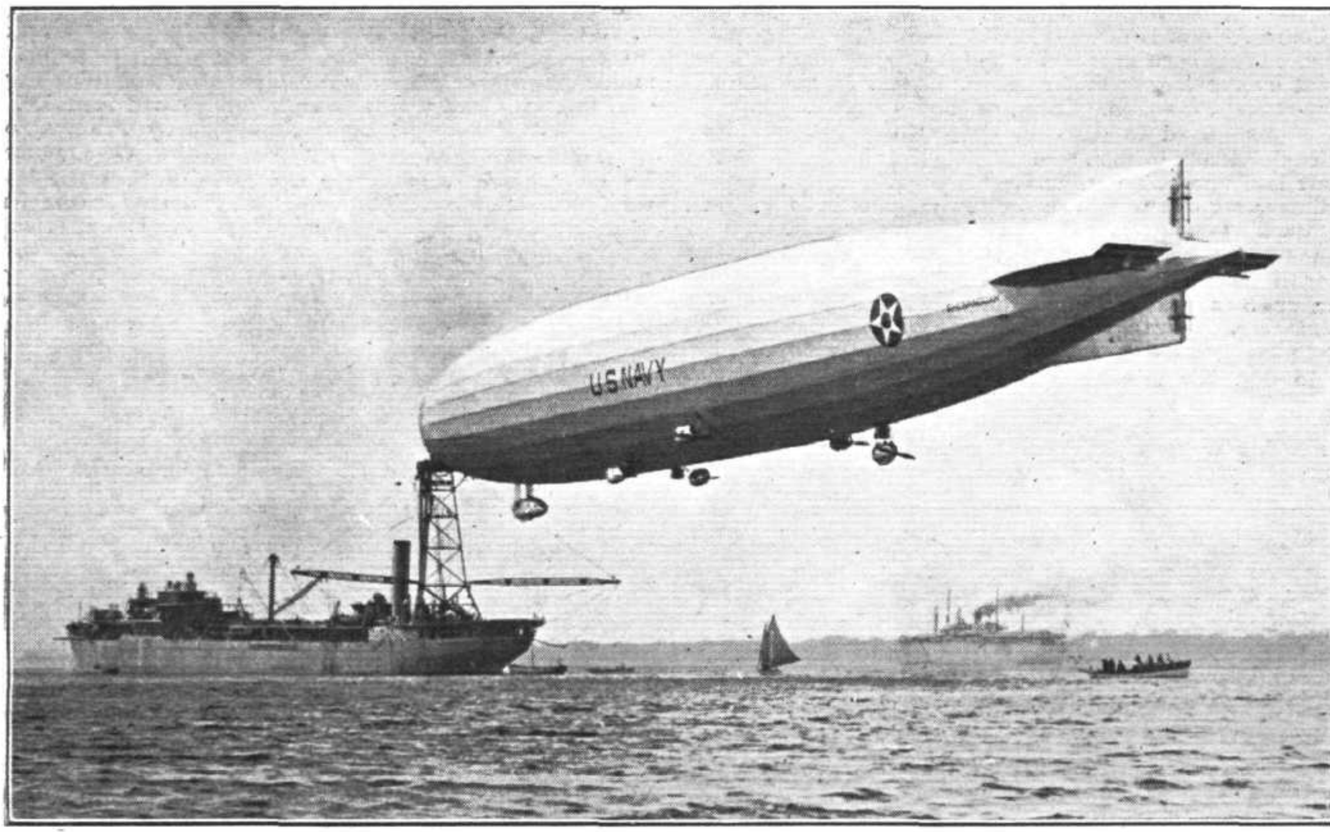
By the loss of the U.S. Naval rigid airship "Shenandoah," or Z.R.1, and some 14 lives, the progress of aeronautics, particularly as regards the development of the lighter-than-air class, has received a severe blow. As might be expected, this catastrophe has resulted in the usual outcry from certain quarters, "Scrap all airships." We think, however, a calm and unprejudiced review of the facts of the case—so far as they have come to light—do not by any means establish once and for all that the lighter-than-air craft as a class was at fault, but rather that the blame for disaster must be attributed to "circumstances over which one has no control," combined, it would seem, with a certain "avoidable accident" element.

The "Shenandoah," which is of the Zeppelin L.33 class, was designed by the U.S. Bureau of Naval Aeronautics, and was built at Lakehurst, N.J., in 1923, since when she has carried out many successful and notable flights. On September 2 the airship left Lakehurst with a crew of 42 officers and men for the purpose of making an extended tour to the middle West as far as Minneapolis, during which it was expected she would pass over about eleven States and visit many big towns. Having successfully crossed the Alleghenies mountains by moonlight, she was reported over Wheeling, West Virginia, at an altitude of about 1,000 ft., in the early hours of the morning. Up to then all had gone well, but shortly after she began to encounter bad weather, until, when over Cambridge, Ohio, she flew into one of those terrible "freak" storms so common in the Ohio belt—from which it is doubtful if even a stronger airship than the "Shenandoah" would emerge undamaged.

The airship was then at an altitude of about 3,000 ft., and for some time endeavoured to escape the storm. Suddenly, however, she was caught by tremendous up currents and rose rapidly to some 5,000 ft. or more. The efforts of the crew to release the rapidly-expanding Helium gas apparently failed, and the strain was too much for the hull of the airship, which broke in two.

The rear, and greater, portion of the hull, some 450 ft. long, with about 20 of the crew aboard, drifted only a short distance before it came to earth with but little loss of life, thanks to the coolness and wonderful efforts on the part of its human cargo. The nose of the ship, however (about 140 ft. in length), plunged downwards, and in doing so the fore control car was wrenched from its attachments and crashed to earth, its 14 occupants, including Commander Zachary Lansdowne, U.S.N., being instantly killed. Meanwhile, the nose of the hull, relieved of the weight of the control car, shot skywards and, with seven men clinging to the framework, proceeded on an erratic flight, balloon-like, for nearly an hour, with lengths of wire and girder trailing behind it. It rose to nearly 8,000 ft. before it commenced to descend. As the control car broke away one of the crew, Lieut. Anderson, only just managed to grasp a girder of the hull and pull himself up into the broken nose. Even then he was in a most perilous position, and it was only by the efforts of one of his companions, who lassoed him with a rope, that he was able to get into a position of greater safety.

As the nose descended to lower levels it was carried across country at nearly 30 m.p.h., and eventually, after colliding with trees and other obstacles, came to rest at the town of Sharon, about 12 miles from the spot where the ship broke in two. One of the seven, Rigger John McCarthy, was thrown heavily to the ground and was badly hurt, but the others managed to escape from the wreckage without serious injury—these were Col. Chalmers Hall (Army Observer), Lieut.-Comdr. Rosendahl (second in command), Lieuts. J. B. Anderson and W. Mayer, and chief machinist's mates Halliburton and Shevotiv.



The "Shenandoah" moored to the s.s. "Patoka"

Thus, it will be seen that had the control car remained in place it is probable that the loss of life would not, in all probability, have been so much.

As previously stated, several criticisms and allegations have been forthcoming in connection with this disaster, but until full details come to hand it is only right to withhold judgment. According to the *Daily Telegraph* correspondent, however, Capt. Anton Heinen, the former German dirigible pilot and construction adviser in the building of the "Shenandoah," stated that the removal of eight of the 18 safety valves on the dirigible's gas bags was the cause of the disaster and that the victims of the crash "gave their lives to save this precious helium." In the storm the craft rose too fast for the remaining valves to let off sufficient gas, he said, the upward movement of the ship causing the rapid expansion of the gas bags, which broke the shell of the ship in the middle. With only 10 safety valves, added Heinen, "I wouldn't have sailed on the 'Shenandoah' for a million dollars."

Sir Samuel Hoare, British Secretary of State for Air, and Air-Chief Marshal Sir H. M. Trenchard have sent messages of condolence to the U.S. Government over the loss of the "Shenandoah."

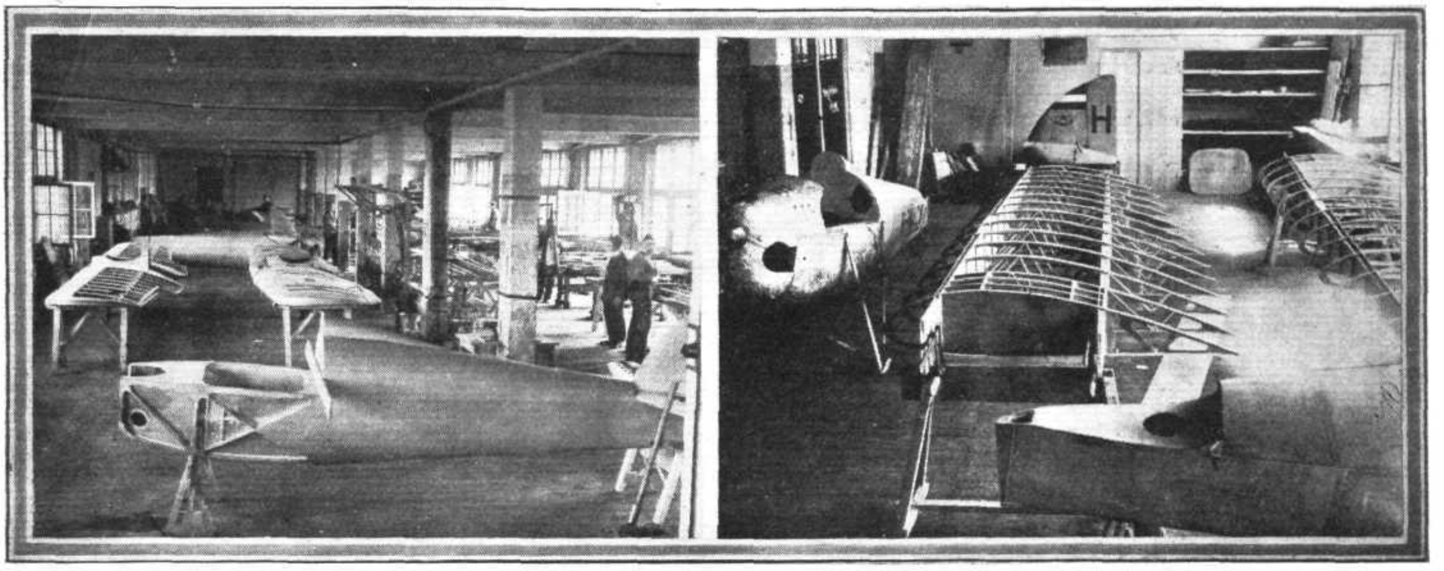
THE HOME OF THE PANDERS

Some Impressions on a Visit to The Hague

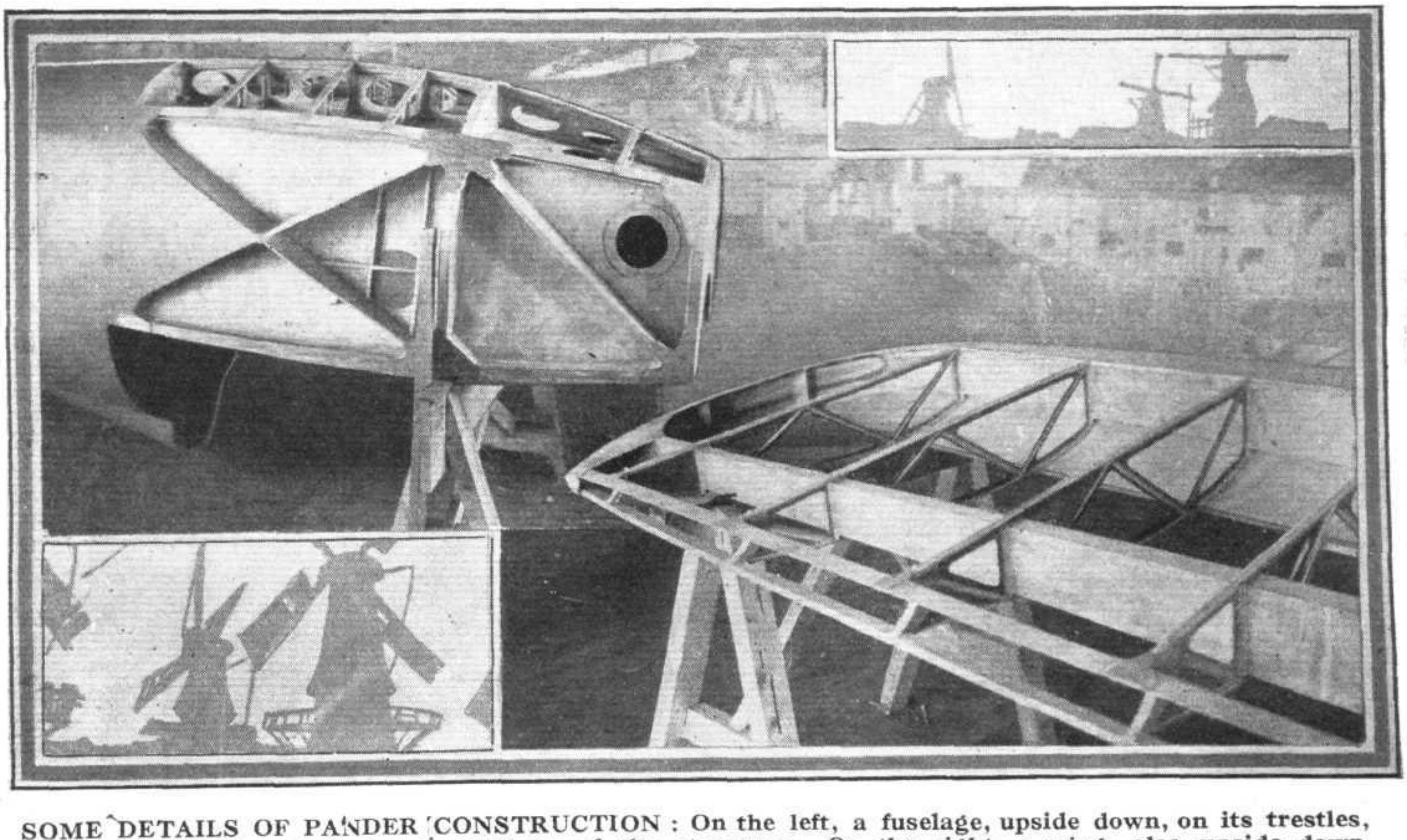
DETAILED descriptions of the light monoplane built by Pander en Zoonen of The Hague have previously been published in FLIGHT, as well as accounts of the various excellent performances put up by this little machine from time to time. Recently an opportunity occurred to visit the Pander works in Holland, and the following notes and photographs are a result of that visit.

We had often puzzled as to how it was possible for Mr. Pander to produce a machine of such excellent workmanship and finish at the price of £450, and although our visit to the Pander works helped, to some extent, in solving the riddle, the value for money offered in this connection is still not wholly explained. It might here be mentioned that the main business of Pander en Zoonen is that of furniture making, and their factory at the Hague is, we should imagine, probably the best of its kind in Holland. Having been for many years accustomed to woodwork of the most exacting kind, it was really small wonder that when Mr. Pander (senior) turned his attention to aeroplane building he should choose wood as his material, and the superb workmanship to be seen in the Pander monoplane is, of course, due to long experience in woodwork of all kinds.

We fear that although one might easily wax enthusiastic about the furniture turned out by Pander en Zoonen, to do so



TWO VIEWS IN THE PANDER WORKS AT THE HAGUE: On the left, fuselages, wings, etc., of the Pander monoplane. On the right, a single-seater fuselage and one of the wings of the two-seater, which is now nearing completion.



SOME DETAILS OF PANDER CONSTRUCTION: On the left, a fuselage, upside down, on its trestles, showing the keel and diagonal members of the structure. On the right, a wing, also upside down, showing spars, ribs, etc. The wing tip rib is of U-section, and built up from numerous laminations. On the top surface the ply-wood covering of the leading edge extends a considerable distance aft of the front spar.

might be of small interest to readers of FLIGHT, although we must confess we have rarely spent a more interesting day than that devoted, to a great extent, to an inspection of modern Dutch furniture making. The Pander factory is entirely self-contained, and everything is made on the premises even to such things as gimp, fringes and tassels, and in the Pander timber yards, situated in another part of The Hague, one saw vast quantities of wood of all kinds, including some extremely rare specimens.

However, although we must refrain from enlarging upon this aspect of Pander products, it is, fortunately, quite easy to become just as enthusiastic on the subject of Pander light 'planes, since these are of the same high standard of workmanship as that found in Pander furniture. As already mentioned, the Pander monoplane has been described and illustrated in FLIGHT previously, and its general construction will, therefore, be known to our readers. Certain details in the construction which have not, we think, hitherto been given prominence are, however, shown in some of the accompanying photographs.

To take first the construction of the fuselage: this is a *monocoque* structure with ply-wood covering, but in the forward part the covering is reinforced by a substantial keel and by diagonal members, to which the ply-wood covering is attached. This form of construction provides a "backbone" which must add enormously to the strength of the structure, and its details are shown quite clearly in one of the photographs. We have previously commented on the extremely smooth finish of the Pander fuselages, and it was interesting to watch the workmen put on the covering. Although appearing to be of purely elliptical cross-section, the fuselage has, in reality, flat sides, but these merge into the top and bottom fairings so gradually that one fails at first to notice them, especially as they form a relatively small proportion of the depth. No special or secret process is employed in getting the ply-wood smooth, and the excellent finish is solely due to the use of good material and care in its application.

The wing construction is also straightforward, with two ordinary box spars and with three-ply ribs stiffened by spruce flanges and strips. An interesting detail, in which the experience in furniture-making and upholstery becomes obvious, is the method employed for attaching the fabric to the framework of the wing. The ribs have thin three-ply webs, and the top and bottom flanges are placed on each side of the three-ply and tacked through. On one side of each rib (and at top and bottom, of course) one half-flange is covered with a sleeving in the form of braid or netting, and to this the fabric is stitched. In this manner the local loads from individual stitches is distributed evenly over the whole flange. The entire leading edge is covered with ply-wood extending on the lower surface back to the front spar, and on the upper surface some distance aft of the front spar, a form of construction making for torsional stiffness. The monoplane wing is built in one piece, and its centre forms the upper portion of the pilot's cockpit, built up of light stringers and ply-wood covering. The wing is attached to the fuselage by four long U-bolts, which in turn are anchored to the ends of steel straps passing under the belly of the fuselage so as to distribute the loads. Such metal fittings as are used are of very neat design, and it is interesting to find that the metalwork, although not a Pander speciality, is in every way of as high a quality as is the woodwork. This is probably another result of Mr. Pander's slogan, to which he adheres rigidly in his aeroplane manufacture no less than in his furniture-making, and which, translated into English, would run: "The best is good enough for me."

At present Mr. Pander is fitting Anzani engines, which, on the whole, have been found to give good results, but he does not, we think, necessarily consider this the only suitable type, and we fancy that other engines, of approximately the same weight, but of a slightly more efficient design, would be favourably considered.

Of a memorable luncheon at the "Royal" during our visit to the Pander works, this is not the place to speak, and over it we will draw a discreet veil. Suffice it to say that it was in every way up to the high standard of Pander "workmanship," and would easily have passed the British A.I.D. inspection. Dutch hospitality is a wondrous thing, and that of Mr. Pander must surely be something out of the ordinary, even for Holland.

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Rome-Melbourne-Tokyo Flight

MAJ. THE MARQUIS DE PINEDO, who is flying from Rome to Japan *via* Australia in a Savoia S.16 ter flying-boat, is still detained at Manila by bad weather.

Third International Aerial Navigation Congress

THE third International Aerial Navigation Congress will meet in Brussels from October 6-10, under the patronage of King Albert and Prince Leopold. The congress will be divided into six sections—juridical, medical, scientific, air navigation, technical, and travel and propaganda. Among those expected to be present are Sir Samuel Hoare, British Secretary of State for Air, Air Vice-Marshal Sir Sefton Brancker, and M. Laurent-Eynac, French Under-Secretary of State for Aeronautics.

Gabriele D'Annunzio's Appointment

SIG. GABRIELE D'ANNUNZIO, the Italian Poet-Aviator of Fiume fame, has been appointed "Honorary General of the Italian Royal Air Force."

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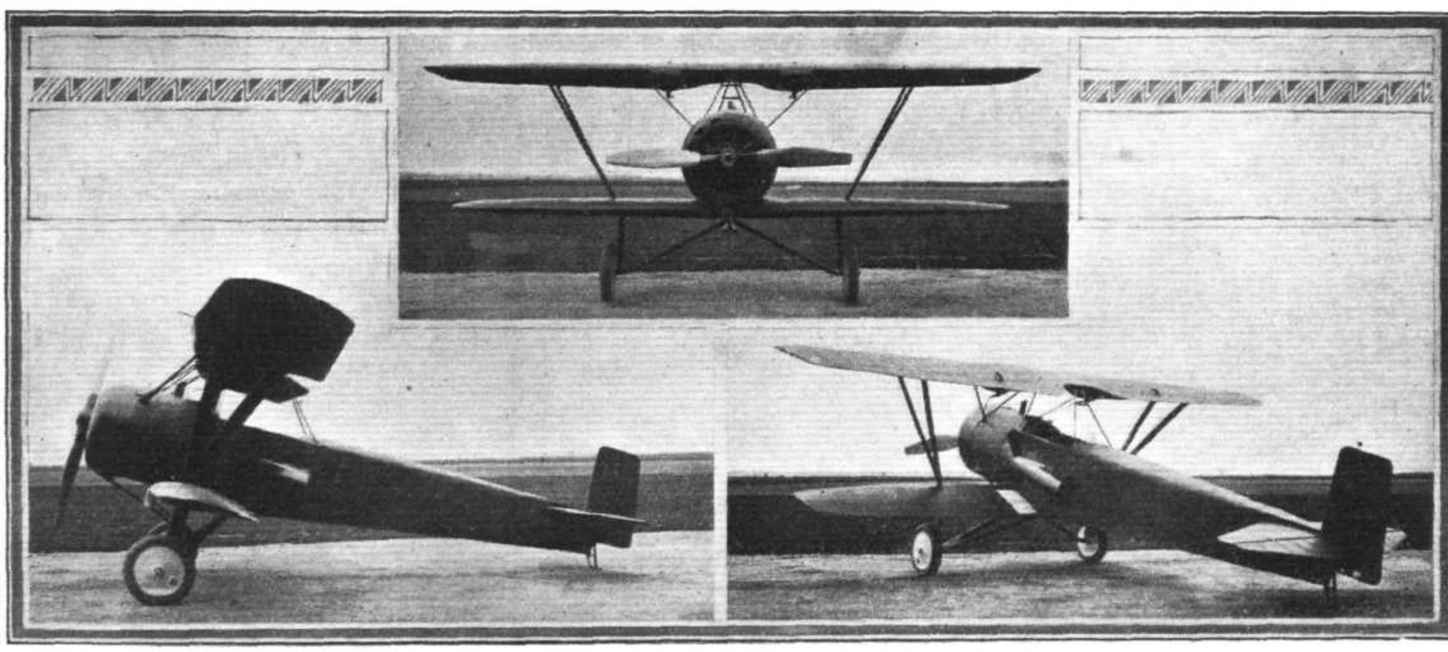


A KOOLHOVEN SCHOOL MACHINE: The F.K.32 is a school machine of rather unusual design, the main features of which are absence of wing bracing and extremely wide wheel track. Two gravity feed petrol tanks are mounted in the top plane. Note the peculiar scoop on the side of the fuselage, which allows the air from the engine cowling to flow back past the cockpits. The machine depicted has a rotary engine, but a similar type can be supplied fitted with Bristol "Lucifer."

AERONAUTICS AT THE BRITISH ASSOCIATION

Interesting Papers Read Before Engineering Section

Among the series of valuable papers read before the British Association at its recent meetings, two were of particular interest to readers of FLIGHT, *as they dealt with various aspects of aeronautics. It is not possible to publish the papers in full, but the following résumés may be of interest :—*

SOME AERONAUTICAL PROBLEMS OF THE PAST AND THE FUTURE

By R. V. Southwell

ON August 28, Mr. R. V. Southwell discussed, at Southampton, some problems of the past and future, during which, according to *The Times* of August 31, he said the future of aeronautics was in our hands to make or mar, because practically the whole of aeronautical research and development was financed and directed by the Government. In aeronautics, which had never yet paid its way, but grew in the artificial atmosphere of Government subsidy, much time and money might be wasted before the fact became glaringly apparent. Many well-disposed but less well-informed people, especially in Parliament, seemed to imagine that progress in aeronautics was a question first and last of money; that technical advance was a mercantile commodity purchasable at a definite amount per £1,000. No view could be more fallacious. Unless our programmes of research and development were well conceived, aiming at the solution of definitely-formulated problems, additional money would do us more harm than good. It was pleasant to feel assured of a favourable hearing when we asked for money, but remembering that we had as yet no economic touchstone by which to test out schemes, we ought to subject them to criticism all the more ruthless on that account, to make sure that we had ideas which we needed money to develop, rather than to ask for money as a preliminary to formulating our ideas.

Discussing the value of public opinion in its relation to the provision of Government funds, he said that for aeronautics it was not merely a matter for benevolent interest that public opinion should be well informed; it might well prove to be an essential condition of its own satisfactory progress. Those whose time was spent on aeronautical research could not afford to regard with complacency public opinion in which speed was held to be more important than reliability. It was better business to proceed steadily with the building of a craft which would fly to India than to talk about non-stop flights to New Zealand. What aeronautics needed most of all was to settle down to steady progress along natural lines of development. No other pass would lead them surely to success in the future, and very few of the "stunt" predictions of the day on examination gave any real promise of important advance.

Passing on to deal with the helicopter, he said that if any Government really wanted to develop a helicopter he saw no reason why it should not have its desire, provided only that it adopted a reasonable procedure for getting it, which was not that of the prize competition. The problem of stability must be attacked by systematic research before anything could be hoped of the helicopter. Such research ought not to be financed by, and therefore kept secret for, the private inventor. If the helicopter had a military importance the knowledge attained would be of national interest, and provision should be made accordingly. If there was any future for the helicopter (of which he personally was not convinced), it was a problem which should be referred to the research committee and to the professional designer. Personally he did not believe that the helicopter was a form of aircraft that would prove to have much military value. He thought that the high-speed aeroplane, unlike the helicopter, was a suitable subject for prize competition.

Year by year the best designing firms in the country should be induced to bring all their knowledge and experience to bear on the problem of "clean" design. So far as possible every restriction which made the problem more difficult should be removed. The designer should not have to complain, as he had at present, that when he had built an aeroplane of "clean" design and was counting on something striking from its speed trials, suddenly a host of experts descended on the helpless craft, and bedecked it with armament, wireless and other "gadgets," until it made its first ascent "looking like a flying Christmas tree." The way to discover the limits of possibility in high speed was to go for high speed "bald-headed." Of course, any aeroplane required for service would have to sacrifice some of its otherwise attainable speed to the needs of armament or wireless, but that was no reason for making those sacrifices in an experimental machine. Rather the reverse.

Safety, comfort and reliability were the true essentials in civil aviation. Until these could be guaranteed it would have attractions only for the few. High speed militated against all three of these essentials, beside being very costly. The lower we could afford to make the top speed of an aeroplane the lower would be its landing speed, on which primarily safety depended. An air speed of anything over 80 miles per hour would suffice to achieve a saving of time over other forms of transport. Indeed, the aeroplane or airship once established as economic and reliable would have hardly a competitor. Was not then research justified in its policy of placing safety first—in seeking to satisfy rather than to create a demand. He characterised as the wildest of all aeronautical predictions those which told of the giant aeroplane. He did not say we had reached a limit in respect of size of aeroplanes, new materials, new principles of construction and, above all, new types of engine, but it was idle to talk gaily of size as an advantage which nothing but our ignorance withheld from our grasp today.

We must take no unnecessary risk in planning the airships with which we hoped to fly to India in 1927. We must design by theory, and in these larger airships we could employ a type of construction which lent itself better to theoretical treatment. We must develop afresh the technique of girder constructiou, and by using stouter material we could employ more of the experience we had already gained. He wished the public could be induced to regard this airship construction as a great adventure, for that was what it was. The goal was the ability to fly to India in comfort and without change in the space of 100 hours; the problem was to design and construct a ship of vast capacity with little help from past experience, by sheer hard thinking and hard work. Having embarked in this country on a definite programme of two large ships, surely common sense suggested that we ought for the next two years to leave the design staffs in peace to do their best, and that silence on their part while their plans developed was a mark of health.

RECENT PROGRESS IN FLYING-BOAT DESIGN.

By O. E. Simmonds, A.F.R.Ae.S., M.I.Ae.E.

MR. SIMMONDS, who was for a considerable time connected with research at the Royal Aircraft Establishment at Farnborough, but who has been with the Supermarine Aviation Works at Southampton for more than a year, said, in a paper read on September 2, that the early conception of the flying-boat was due to the aeronautical rather than to the marine community. The result was that the marine functions of the early flying boats were given somewhat primitive treatment, and, as a result, the hulls were fragile and unseaworthy. The more logical system of making a boat that would fly, rather than an aeroplane that would float, received attention in due course, and by 1918 the flying boat was definitely recognised as an amphibious machine, and its marine and aeronautical functions were being given full and separate consideration. Thus the outlook of the flying-boat designer underwent a complete change. Mention having been made of the necessity of giving separate treatment to the marine and aeronautical functions of the flying-boat, the lecturer sub-divided his paper under these two headings.

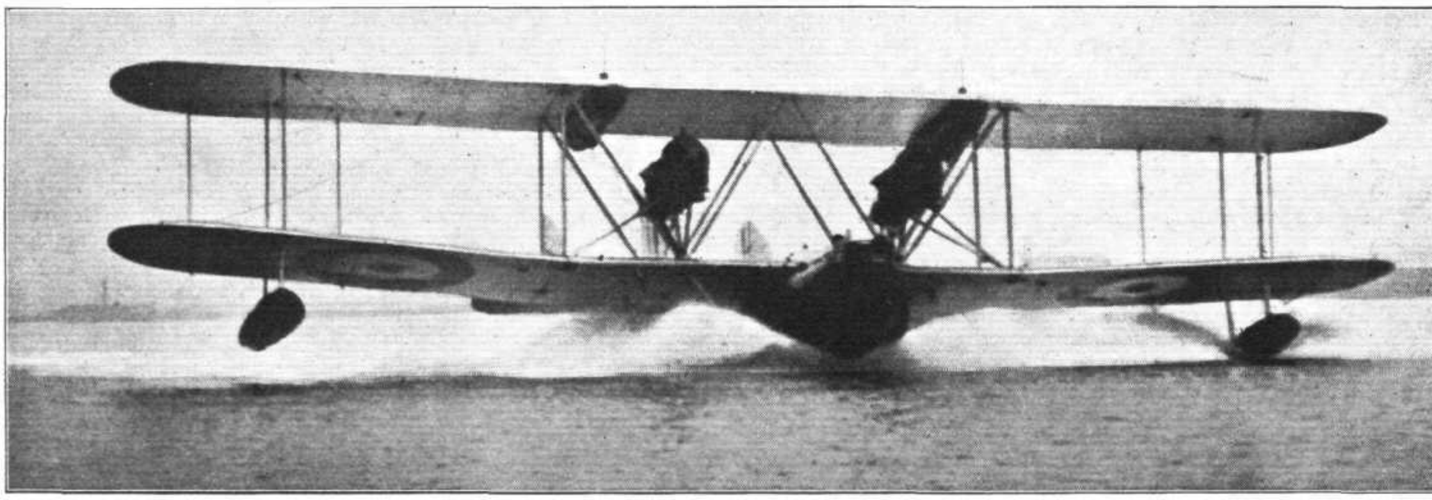
The Marine Functions of a Flying-Boat.

Mr. Simmonds said it would be convenient to consider separately the developments in hydrodynamic and constructional design. The seaplane had initiated a new branch of hydrodynamics, and in the design of a flying boat hull the following points had to be given careful consideration :—

(1) Static trim; (2) Hump resistance; (3) Steady running; (4) Cleanliness.

1. *Static Trim.*—It was, the lecturer said, desirable when at rest to keep the centre of buoyancy well forward so that the aircraft trims up by the bows. This enabled a boat at anchor to ride well and cleanly, and when opening out the engines, it prevented the thrust moment of the propellers from nosing the hull under water.

2. *Hump Resistance.*—Hump resistance was originally a point of prime importance to the designer of a flying-boat hull. A slide was shown which indicated that the maximum resistance occurred at a speed of somewhere between twenty and thirty knots, and unless there was a margin of thrust over drag at this critical speed, the machine could not be further accelerated. Two factors had combined to remove this difficulty: a decreased resistance due to an improvement in hull lines, and a lower power loading which was the result of a demand for higher performance in flight.



THE SUPERMARINE "SOUTHAMPTON": Note the clean running of the machine, reference to which was made in the paper read by Mr. Simmonds. The engines are Napier "Lions."

3. *Steady Running.*—Steady running was imperative, firstly, because even small changes of angle induced a very large increase in the area of immersion, and secondly, because the longitudinal oscillations were likely to build up until the aircraft was thrown into the air by the water forces before it had attained sufficient speed for the wings to sustain it. This vice was known as "porpoising," but experience had now enabled them to entirely obviate the trouble by the suitable location of two steps in the planing bottom of the hull. This enabled aircraft to leave the water at a speed very little greater than the minimum necessary for complete sustentation, and had the added advantage of relieving the pilot of the responsibility of lifting the machine off the water by means of his elevator.

4. *Cleanliness.*—Cleanliness in taxying on the water and during the get-off and alighting runs was desirable from many points of view. Dirtyness inevitably meant high resistance, and therefore long runs to take off, and it also caused discomfort to the crew and might even break the propeller-blades. Accurate bow design and suitable shape of the planing bottom and chines now serve to get the water well down and out, and a slide was shown of the Supermarine "Southampton" taking off, in which the remarkable cleanness in running was well illustrated.

This all-round improvement of water performance combined with increased strength and ability to ride out heavy seas, had been secured without increasing the weight economy figure, $\frac{\text{Weight of hull}}{\text{Weight of aircraft}}$.

Hull Construction

Turning to the subject of hull construction, the lecturer referred briefly to the earlier flying boats, which had more or less rigidly braced hulls, and said that the new conception of a boat which would fly meant abandoning this rigid braced hull and supplanting it by a flexible boat-built construction in which timber was utilised throughout, and a multitude of wires and small metal fittings were entirely obviated. Mr. Simmonds said it was not possible in his paper to enter into the details of flexible wooden hulls, but the main principle was that the shell, which was usually composed of two skins of mahogany planking, was relied upon to transmit the loads. Various methods of supporting and stiffening the shell were in use, but all relied upon some form of transverse frame or hoop with longitudinals placed at about 6-ins. centres. Hulls built in this manner had only one great drawback—namely, their absorption of moisture.

In a wooden hull weighing 2,000 lbs. the soakage in three months would be of the order of 300 lbs., *i.e.*, 15 per cent. of the hull weight or 2 per cent. of the total weight. It was, the lecturer stated, by no means a pleasant thought that they were carrying about 300 lbs. useless weight, and this fact had been one of the greatest inducements to the substitution of metal for wood in hull construction. Moreover, the wooden hull had so nearly reached the limit of its logical development that for increased efficiency they must turn to other materials. A table was then given showing the relative efficiencies of various suitable metal and alloy sheets:—

Material.	Max. stress, tons/sq. in.	Max. stress, / density.	Percentage, efficiency.
Duralumin ..	27	9·6	100
Stainless steel ..	40	5·1	53
Aluminium ..	10	3·67	38
Mild steel ..	26	3.3	34
Timbers—	Max. compressive stress, tons/sq. in.		
Spruce	2·23	5·2	54
Mahogany ..	2.68	5·0	52

The use of the elastic limit instead of the maximum stress did not alter the relative positions of the metallic materials, although clearly it considerably increased the efficiency of the timber, as shown in the following table:—

Material.	Elastic limit, tons/sq. in.	Elastic limit, / density.	Percentage, efficiency.
Duralumin ..	13·5	4·8	100
Stainless steel ..	32·0	4·1	85
Aluminium ..	7·5	2·75	57
Mild steel ..	13·0	1·65	34
Timbers—			
Spruce ..	2·23	5·2	108
Mahogany ..	2·68	5·0	104

In each case the lecturer had assumed 100 per cent. efficiency for duralumin. From the tables it was seen that duralumin outclassed stainless steel in strength for weight, but in other respects stainless steel appeared to have definite advantages. At this stage in the development of stainless steel the degree of malleability that could be obtained was a little uncertain, but, on the other hand, its highly resistive qualities to the corrosive action of sea-water appeared to be well established.

With duralumin, plating, painting, or varnishing gave a high degree of immunity from corrosive action, but the slightest puncture of the coating was liable to be a source of trouble.

As far as the lecturer was aware all modern aircraft manufacturers in this country and abroad had, for the moment, turned their attention to duralumin in preference to steel. For the size of hull they were at present building the steel sheets for the skin of the boat would have to be thinner than was practically possible in order to realise the full comparative efficiency figure. The largest successful

flying boats hitherto built weighed about 30,000 lbs., and the lecturer expressed the opinion that there was a considerable way to go yet before steel could supplant duralumin for hull construction. He hazarded the prophecy that in a 60,000-lb. boat steel would be inefficient from the weight point of view, but it would be likely to pay in the case of a 100,000-lb. machine. He pointed out that in saying this he was assuming that all difficulties in the manufacture and working of stainless sheet steel would by that time have been removed.

The actual constructional design of metal hulls was being tackled in two distinct ways. In this country we had more or less adhered to recent wood practice by building the hull on transverse frames with longitudinal members, the transverse frames being made of duralumin sheets and varying in depth from a few inches to as much as 2 ft. on the keel amidships.

The longitudinals could conveniently be made in U-section strip flanges being provided at the top of the U for riveting the plates.

In the designs of Dr. Rohrbach the transverse section of the hull had been made rectangular and the planing bottom forward of the main step was flat. These external lines clearly indicated a girder construction with the outside plating bracing the bays. One advantage of this method was the ease with which transverse bulkheads could be fitted. Bulkheads had been successfully designed for flexible hulls, but they must necessarily be flexible in themselves, and this represented an extra weight over the bulkheads in the rigid boat where the bulkheads were definitely structural members. Even with the small amount of experience possessed they had been able to build good and serviceable duralumin hulls for the same weight as similar wooden hulls, and indeed some designers considered that by using duralumin they had reduced their hull weight, exclusive of hull soakage, by as much as 20 per cent. It was difficult to obtain true comparative figures, but at least it could be said that in choosing duralumin construction an economy in weight as great as 20 per cent. might be expected even for small boats, while in a flying boat of 60,000 lbs. gross weight the increase of this figure to 30 per cent. was by no means impossible.

The lecturer then referred to the difficulty of avoiding entirely the use of steel bolts and fittings, and pointed out that use of the two materials together might set up electrical tension and corrosion. Protective painting and the use of red lead helped somewhat, but even when every precaution was taken, working between parts was certain and corrosion then became only a matter of time. In this particular respect the stainless steel hull would have very definite advantages. In the meantime it was necessary to show great vigilance in ground inspection of points of contact.

Aerodynamic Improvement

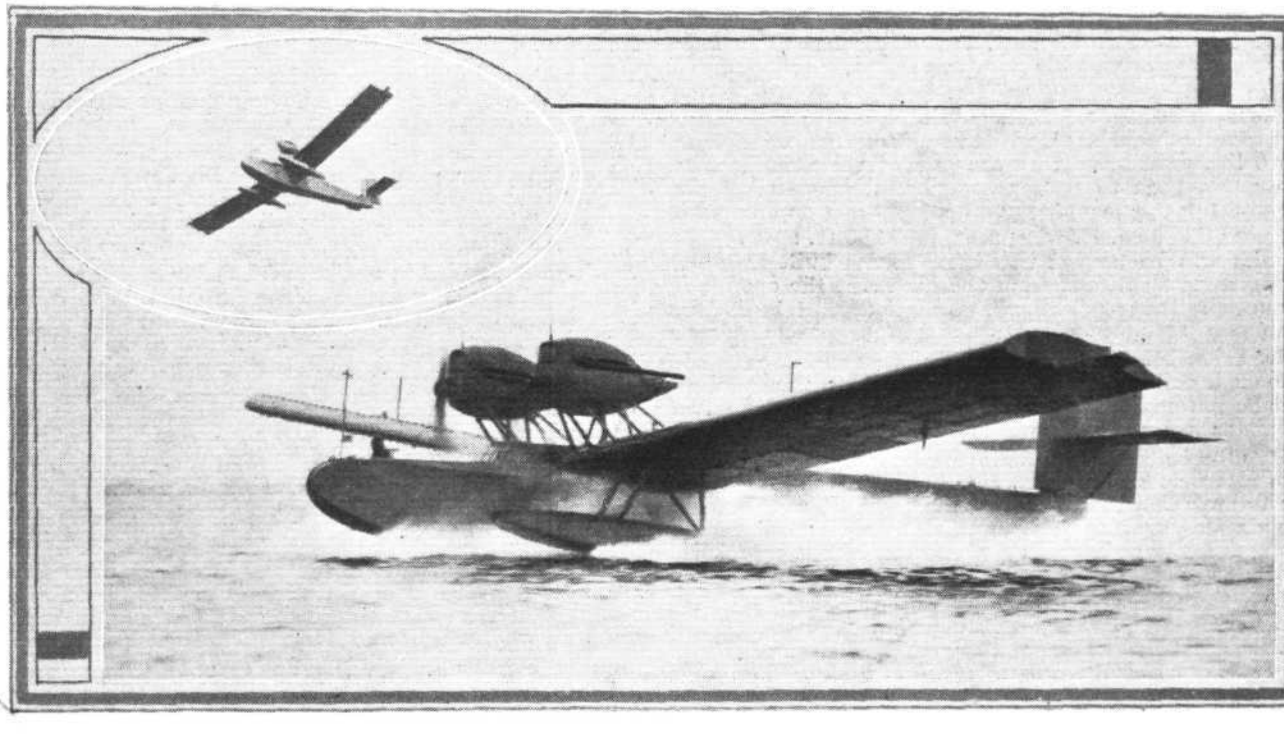
Turning to the aerodynamic functions of the flying boat, the lecturer said that aerodynamically improvement had been effected in aerofoil characteristics and in the reduction of parasite drag.

Concerning the former the lecturer referred to two new aerofoils recently designed at the Royal Aircraft Establishment of which the section known as the R.A.F. 30 had a centre of pressure which was constant to within 2 per cent. of the chord throughout the normal flying range, and the R.A.F. 33 which had a centre of pressure movement of 6 per cent. R.A.F. 30 suffered, however, from a low value of the maximum lift coefficient, which was only 0·46. The maximum lift coefficient of R.A.F. 33 was 0·61. The drag of this section was greater than that of R.A.F. 30. If from these aerofoils there could be designed a new section having a maximum lift coefficient of at least 0·6 and a C.P. movement between k_L 0·1 and k_L max. of about 12 per cent. and a minimum drag approaching that of R.A.F. 30, then something very material would have been achieved.

In the reduction of parasite drag the utilisation of thicker wing sections had been of the utmost importance, and it had been left to Dr. Prandtl of Göttingen University to show that aerofoils could be designed having twice the relative thickness of the normal thin section without loss, and in certain cases with considerable gain of aerodynamic efficiency. It was in the case of the monoplane that the efficiency of the thick wing was most marked, as it might be possible to dispense with all external bracing. The quantitative values of the absence of bracing was shown in the following table which detailed the resistance of the various component parts of a biplane flying boat of clean design :—

	Per cent. of total drag.
Wings	40
Wing bracing	18
Hull and floats	15
Tail planes, fins and rudder	9
Power units	18

The lecturer pointed out that in practice the saving indicated was not fully obtained, as the monoplane for the same wing area required a greater wing chord than the biplane to obtain the same degree of longitudinal control, and it was therefore necessary either to lengthen the hull or increase the area of the tail surfaces, either of which would increase resistance. For the same performance as the biplane, the internally-braced monoplane wing reduced the horse-power required by no less than 15 per cent. Conversely, for the same engine power the top speed was increased by 6 or 7 per cent. and the climb by about 15 per cent.



THE ROHRBACH ALL-METAL FLYING BOAT: The methods of construction employed were referred to by Mr. Simmonds in his paper before the British Association.

Turning to the question of wing construction, the lecturer said that the problem in its material aspects was similar to that of the hull, but the constructional design of the metal wing was clearly a problem in itself. Development had proceeded along two distinct lines. In one method the wing stress was concentrated in two or more spars, while in the other the skin of the wing was arranged to transmit the loads. For a multiplane structure he thought it probable that the separate spars afforded the best solution. In the wing with the stressed shell the system relied for its strength on a wide, built-up box girder running the whole length of the span. In depth it conformed to the ordinates of the aerofoil section, and in width it was about 0·6 of the chord, the front of the girder being about 0·1 of the chord from the leading edge. The two skins were built up of duralumin plates riveted together, and their thickness for minimum weight should vary from tip to root relatively with the bending moment. The skins were connected together by at least two longitudinal webs, and transverse frames were provided to stiffen the skin and resist torsion.

Tapering the wings towards the tips in plan form was economic aerodynamically and structurally, but not financially. In the box girder construction, the structural difficulty of a parallel wing was easily solved, for a slight increase in the thickness of the plates at the root would resist the increase in bending moment due to a larger span. Thus one rib profile could be used throughout, and the expense of a large number of rib jigs of varying sizes was saved.

Mr. Simmonds concluded with a brief reference to the future, in which he said : " I shall certainly feel that progress has been inordinately slow if we have not constructed a boat of 100,000 lbs. gross weight by the end of the next decade. Supposing this boat to be for commercial purposes, I am inclined to think this machine will be an all-metal monoplane boat of some 6,000 sq. ft. wing area, and 220 ft. span. The power units will be housed in engine rooms built into the thick wing some 30 ft. out from the hull, and the output of each room at full revolutions will be some 3,000 b.h.p. The engines may well be arranged either side of a central propeller shaft, the drive being through bevel wheels with a separate clutch to each unit. In the event of the failure of any block this will be automatically cut out and the mechanics could then consider its repair. Once the boat were in the air, it could fly comfortably on 60 per cent. of full power, and the fear of a forced landing might, therefore, be dismissed.

" The hull will be arranged in two decks and provide spacious accommodation for 100 passengers. The speed will exceed 100 knots, and the boat could undertake flights up to 1,500 miles without alighting. By slightly reducing the number of passengers, therefore, such a boat could fly from Europe to America with only one stop at the Azores, and accomplish the whole flight in 36 hours."

THE DISCUSSION

Sir Archibald Denny, who was in the chair, complimented Mr. Simmonds on his very able paper, and then called upon Wing-Commander T. R. Cave-Brown-Cave to open the discussion.

Commander Cave-Brown-Cave said he thought they were to be congratulated on Mr. Simmonds, who had such high technical ability, taking up the subject of flying boat design. One point in Mr. Simmonds' paper which interested him very much was the reference to the two steps being so arranged that when flying over calm water they automatically set the hull at the angle which would give the wings their maximum lift. It used to be considered desirable that the boat should get off on to her forward step and would then be very easily controllable by the car controls, so that the pilot could set her at what angle he wished. The reason for that was that when taking off in a swell it was necessary to be able to avoid being thrust off into the air from the top of the swell. While the automatic arrangement was, doubtless, satisfactory for taking off in a flat sea, he would very much like to know whether the two steps were also satisfactory in taking off from a swell.

He entirely agreed with Mr. Simmonds as regards getting to a metal hull at the earliest possible moment. The wooden hull was all right at home, but he dreaded to think what would happen to wooden hulls in places like Burma or in the Tropics.

On the question of construction, Commander Cave-Brown-Cave said he felt that what was required was a very careful investigation of the structure of the flying boat skin in order to get the metal into tension. The alternating bending as the skin met the water was the worst possible load to which one could expose the metal, and he thought that one wanted to alter the structure so that this metal was in tension. One could then get the full advantage of the interesting tables which the lecturer had shown.

Commander Cave-Brown-Cave said there was one point to which no reference had been made—but which he was very glad to see in the "Southampton" machines, namely, the petrol tanks on the wings. He considered the removal of the petrol tanks from the interior of the hull a most important step, as the tanks on the wings were extraordinarily immune from fire.

As regards the increase of size in flying boats, Commander Cave-Brown-Cave thought the great advantage of increase might lie in the increase of seaworthiness. The fundamental difficulty was that the structure was designed to be suitable for passing through the air at very high speed. Water was 400 times as dense as air, and consequently a load produced by water striking the air structure with the same speed as the air itself was enormous. The air structure had to be kept clear of the water, which was not at all an easy thing to do, and the slides that had been shown of the " Southampton " indicated how very ably that had been accomplished, and he thought this boat of admirable design in this respect. The " Southampton " had been produced within the past two years, and a very large proportion of the requirements that were known to pilots in the past now appeared in that type of machine in a perfectly satisfactory form. That, in his opinion, was a sign of very healthy progress.

In conclusion, Commander Cave-Brown-Cave joined issues with Mr. Simmonds on the question—airship or flying boat? He did not agree with the lecturer when he said that a big flying boat was an aircraft for long-distance transport. There was one point which was not perhaps always realised. If one took a 3,000 miles trip it was going to take 30 hours even at a speed of 100 m.p.h., and during thirty hours passengers required a considerable amount of comfort. Even sitting in a really comfortable cabin, he would be very sorry to be there for thirty hours. In the airship there was almost unlimited space for passengers.

Professor F. C. Lea, of Sheffield University, referred to his work in connection with the use of metals in aircraft, and emphasised the advantage of big machines for the development of metal construction.

Mr. Simmonds, in reply to Commander Cave-Brown-Cave, stated that he had not intended to indicate that a pilot could leave a boat to herself until she took the air, but rather that in a modern boat this was a possibility, whereas in war-time boats it certainly was not. They had improved, not reduced, the control of the pilot while the boat was still on the water, and the ability of the new boats to get off in swells was much improved.

AERONAUTICAL RESEARCH

Technical Report of the A.R.C. for 1923-4

THE Technical Report of the Aeronautical Research Committee for 1923-4, has just been issued in two volumes. The price is £1 2*s*. 6*d*. (net) for each volume, and copies may be obtained at His Majesty's Stationery Offices.

Volume I. contains the Annual Report of the Aeronautical Research Committee for the year 1923-4, and appendices on the subject of aerodynamics (model and full-scale). Volume II. contains Technical Reports only, on the subjects of scale effect, materials, compasses, engines, etc.

The majority of the Technical Reports have, of course, been issued separately as Reports and Memoranda, but, for the guidance of those contemplating the purchase of the bound volumes, we give below their contents.

Vol. I.—Aerodynamics (Model and Full-scale)

Aerodynamics (General)

On the aerodynamic characteristics of parachutes. A comprehensive account of researches incorporated in various papers submitted to the Advisory Committee for Aeronautics. Compiled by R. Jones, M.A.

Aerofoils

The interference of wind channel walls on the aerodynamic characteristics of an aerofoil. By H. Glauert, of the Royal Aircraft Establishment. Presented by the Director of Research.

On the use of a slotted trailing flap on aerofoils of various

cambers. By F. B. Bradfield, of the R.A.E. Presented by the Director of Research.

Further experiments on tandem aerofoils. By W. L. Le Page.

Biplane investigation with R.A.F. 15 section. Part III.—Tests at various staggers and gap chord ratios. By W. L. Cowley, A.R.C.Sc., A. G. Gadd, L. J. Jones and Sylvia W. Skan.

Test on a large aerofoil of R.A.F. 15 section. By L. F. G. Simmons, B.A., A.R.C.Sc., and E. Ower, B.Sc., A.C.G.I.

Experimental tests of the vortex theory of aerofoils. By H. Glauert, of the R.A.E. Presented by the Director of Research.

Theoretical relationships for a biplane. By H. Glauert, of the R.A.E.

The prediction on the Prandtl theory of the lift and drag for infinite span from measurements on aerofoils of finite span. By A. Fage, A.R.C.Sc., and H. L. Nixon.

Complete Model Experiments (Aeroplanes)

Pressure distribution over the wings of, and force measurements on, a model B.E. 2C biplane with raked wing tips. By A. S. Batson, B.Sc., and H. L. Nixon.

On the effect of sideslip on the aerodynamic forces and moments (including those due to the controls) of a model S.E. 5A aeroplane. By H. B. Irving, B.Sc., and A. S. Batson, B.Sc.

Model Experiments (Seaplanes)

Experiments with model flying boat hulls. 24th series report. Comparison of longitudinal with transverse steps. By G. S. Baker, O.B.E., late R.C.N.C., M.Inst.N.A., and E. M. Keary, A.M.Inst.N.A.

Full-Scale Experiments (Aeroplanes)

The lateral stability of S.E. 5A in gliding flight. By E. F. Relf, A.R.C.Sc.

Determination of lift and drag coefficients during a stall by means of accelerometers. By F. W. Meredith, of the Aerodynamics Department, R.A.E. Presented by the Director of Research.

The measurement of aeroplane speed with special reference to the use of a suspended static head. By H. L. Stevens, of the R.A.E. Presented by the Director of Research.

Stability

An investigation of downwash in the slipstream. (Part I.) By L. F. G. Simmons and E. Ower, of the National Physical Laboratory. With Appendix by H. Glauert, of the R.A.E.

An investigation of the influence of downwash on the rotary derivative M_φ. (Part II.) The effect of the airscrew slipstream. By L. F. G. Simmons, B.A., A.R.C.Sc., and E. Ower, B.Sc., A.C.G.I.

Calculation of the rotary derivatives due to yawing for a monoplane wing. By H. Glauert, of the R.A.E. Presented by the Director of Research.

Airscrews

Notes on the vortex theory of airscrews. By H. Glauert, of the R.A.E. Presented by the Director of Research.

Full-scale determination of the characteristics of a variable pitch airscrew. By F. W. Meredith, of the R.A.E. Presented by the Director of Research.

The effect of a large boss on airscrew performance. By A. Fage, A.R.C.Sc.

The efficiency of a tandem system of airscrews. By H. Glauert, of the R.A.E. Presented by the Director of Research.

Experiments with a close tandem airscrew pair. By E. J. H. Lynam, of the R.A.E. Presented by the Director of Research.

The effects of tip speed on airscrew performance. An experimental investigation of the performance of an airscrew over a range of speeds of revolution from "model" speeds up to tip speeds in excess of the velocity of sound in air. By G. P. Douglas and R. McKinnon Wood, Aerodynamics Department, R.A.E. Presented by the Director of Research.

Some experiments on airscrews at zero torque, with applications to a helicopter descending with engine "off" and to the design of windmills. By C. N. H. Lock, M.A., and H. Bateman, B.Sc.

Experiments with a family of airscrews (Part III). Analysis of the family of airscrews by means of the vortex theory and measurements of total head. By C. N. H. Lock, M.A., and H. Bateman, B.Sc., A.C.G.I., D.I.C.

Vol. II.—Scale Effect, Materials, Compasses, Engines, Etc.

Scale Effect

Lift and drag of the Bristol Fighter with wings of three aspect ratios. By the Aerodynamics Staff, R.A.E. Presented by the Director of Research.

Lift, drag, and pitching moment of the $\frac{1}{8}$th-scale Bristol Fighter model in the Duplex Wind Tunnel. By E. F. Relf, A.R.C.Sc., and E. Ower, B.Sc., A.C.G.I.

Scale effect on struts and drag of wiring plates of a Bristol Fighter. Correction of model tests for comparison with the full-scale. By F. B. Bradfield, Aerodynamics Department, R.A.E. Presented by the Director of Research.

Full-scale and model measurements of pressure distribution round two ribs of a B.E. 2E aeroplane with R.A.F. 19 section. By A. C. Kermode and B. D. Clark (full-scale) and R. G. Harris (model), Aerodynamics Department, R.A.E. Presented by the Director of Research.

Full-scale and model measurements of pressure distribution round one rib of a B.E. 2C aeroplane with R.A.F. 15 section. By A. C. Kermode (full-scale) and R. G. Harris (model), of the Aerodynamics Department, R.A.E. Presented by the Director of Research.

Lift and drag of standard Bristol Fighter with R.A.F. 4D engine. Comparative full-scale and model tests. By the Aerodynamics Staff of the R.A.E. Presented by the Director of Research.

The lift and drag of a standard Bristol Fighter aeroplane. By the Aerodynamics Staff of the Royal Aircraft Establishment. Presented by the Director of Research.

Determination of scale effect on the centre of pressure of R.A.F. 14, B.E. 2C biplane with three values of stagger. By the Aerodynamics Staff, R.A.E. Presented by the Director of Research.

Report of the Design Panel on the scale effect on lift, drag, and centre of pressure of complete aeroplanes.

Wind Tunnels

Elimination of the static pressure gradient along wind tunnels of the N.P.L. type. By L. F. G. Simmons, B.A., A.R.C.Sc., and E. Ower, B.Sc., A.C.G.I.

The "Duplex" wind tunnel of the National Physical Laboratory. By T. Lavender.

An experimental test of the Prandtl correction for tunnel wall interference. By W. L. Cowley, A.R.C.Sc., and L. J. Jones.

Materials

The effect of scratches and of various workshop finishes upon the fatigue strength of steel. By W. Norman Thomas, M.A., D.Phil., M.Sc., A.M.I.C.E. Presented by the Director of Research.

The effect of a temperature of 212° F. on steel submitted to alternating torsion. By Prof. W. Mason, D.Sc.

Compasses

Preliminary report on the forced oscillations of aircraft compasses. By Flight-Lieut. R. S. Capon and Dr. A. Lee (Air Ministry Laboratory, South Kensington).

Tests on improved models of aircraft compasses. Communicated by the Superintendent, Air Ministry Laboratory.

The northerly turning error of compasses in aircraft. By A. P. Rowe, A.R.C.Sc.

Engines

Tests of R.A.E. gear-wheel type petrol pump. By the Staff of the R.A.E. Presented by the Director of Research.

Phase setting of engine indicators. By H. Moss, D.Sc., A.R.C.Sc., D.I.C., and W. J. Stern, B.Sc., A.R.C.Sc., D.I.C. of the Air Ministry Laboratory. Communicated by the Director of Research.

Flight tests with R.A.E. electrical indicator. By the Staff of the R.A.E. (Engine Experimental Department). Presented by the Director of Research.

Air-hydrogen explosions in closed vessels. By R. W. Fenning, M.B.E., B.Sc., D.I.C.

Fire Prevention

Fire experiments with various types of fireproof bulkheads. By the Staff of the Royal Aircraft Establishment.

Exhaust manifold temperatures. By the Staff of the R.A.E.

TWO ITALIAN COMPETITIONS

For Low-Power Two-Seater Aeroplanes and Seaplanes

Two Italian competitions of considerable interest will be held this year, both of very similar character, and for an equal amount of prizes, one being for seaplanes and the other for aeroplanes. The former will be known as the "Coppa del Mare," and the latter as the "Coppa d'Italia." In each case the first prize is one of 150,000 lire, and the second prize of 50,000 lire, while the winner of the first prize will also receive a cup valued at 30,000 lire. Both are International events, to be flown under the competition rules of the F.A.I., and it is hoped that British firms will be represented.

COPPA DEL MARE

This competition is for two-seater seaplanes with central hull and with single engine of 40 to 90 h.p., driving a tractor air-screw. The useful load carried (pilot and passenger) in the competition must be made up to 175 kgs. (385 lbs.) exclusive of petrol and oil. A qualification for participation in the competition is that the machines must have a stalling speed not exceeding 70 kms./p.h. (43·5 m.p.h.), and a top speed of not less than 100 kms./h. (62·2 m.p.h.). Machines must be fitted with all the usual instruments, and in the case of water-cooled engines a radiator thermometer must be fitted. Petrol and oil cocks must also be provided for the rapid emptying of tanks for measuring purposes. The competition will be over a course of not less than 250 kms. (155 miles), and during the first 50 kms. competitors must climb to an altitude of 1,000 m. (3,280 ft.), as shown by a registering barograph which will be carried by each machine.

Classification will be according to the following formula :—

$$V_m \times \frac{175}{Ct} \times \frac{V\text{max.}}{V\text{min.}} = x,$$

in which V_m equals the average speed (in kilometres), arrived at by dividing the total distance covered in the competition (in kilometres) by the total time taken. The figure 175 represents the useful load (in kilograms), and Ct is the weight of fuel and oil consumed during the competition. Vmax. and Vmin. are the high and low speed (in kilometres), as determined during the eliminating tests.

Special Regulations for 1925

For the 1925 Coppa del Mare the organisation will be in the hands of the Aero Club of Naples, and the circuit chosen is one of 28 kms. (17·4 miles), which will have to be covered nine times, giving a total distance to be covered without alighting of 252 kms. (156·6 miles). The circuit is Naples–Cape Posillipo–Torre del Greco–Naples.

The eliminating trials will be held on October 24-27, and the competition itself on October 28. In the high- and low-speed tests, which will be flown up and down a 3-km. course, the machines must fly at a constant altitude—*i.e.*, they must not climb or dive ; and in the case of high-speed tests the height must not exceed 100 m. (328 ft.), and in the low-speed tests the altitude must not exceed 250 m. (825 ft.).

Entries should reach the Aero Club d'Italia, Via del Tritone, No. 183, Rome, not later than 12 o'clock on October 1. The entrance fee is 1,000 lire for each machine.

COPPA D'ITALIA

In general, the regulations for this competition are exactly similar to those of the seaplane contest, with the exception that it is for aeroplanes, and that the distance to be covered is rather greater.

The eliminating trials for the Coppa d'Italia will be held at the Montecelio aerodrome, Rome, on November 11-14, at which the 3-km. course for the speed tests will be laid down.

The final competition will be flown on November 15 over a circuit of 50 kms. (31·1 miles), the circuit being Centocelle-Ciampino-Montecelio-Centocelle. The circuit has to be covered six times, giving a total distance of 300 kms. (188 miles), and during the first lap competitors have to reach an altitude of 1,000 m. (3,280 ft.). The formula used is identical with that used in the Coppa del Mare.

Entries should reach the Aero Club d'Italia not later than 12 o'clock, October 31, and the entrance fee is 1,000 lire.

Personals

Married

Flying Officer R. STANLEY BARBOUR, 39th (B) Squadron (late Royal Irish Fus. and 113th Squadron R.F.C.), was married on July 15, at Barnwood Church, Gloucester, to OLIVE GRACE, only daughter of Mr. and Mrs. DAN CRUMP, of Gloucester.

Flight-Lieut. HUGH ROBERT JUNOR, R.A.F., was married at Byfleet Parish Church, on September 3, to ELSIE HENRIETTA TARRANT, younger daughter of Mr. and Mrs. W. G. Tarrant, of Lake House, Byfleet. Mr. John F. Mercer, R.A.F., was best man.

LESLIE WALTER THRES, D.F.C., elder son of Mr. and Mrs. H. W. Thres, Ilford, Essex, was married on September 2, at St. Peter's Church, Gamston, Retford, to BARBARA MARY, younger daughter of Mr. and Mrs. ARNOLD GAMBLE, Gamston Manor, Retford.

Sqdn.-Ldr. R. S. OVERTON, M.R.C.S., R.A.F., of Sutton Lodge, Sutton, Surrey, was married on August 26, at the Savoy Chapel, to JUSTINE LEONTINE ("JEAN") BROMAN, of Oslo, Norway.

Sqdn.-Ldr. G. G. A. WILLIAMS, R.A.F., was married on September 2, at St. Andrew's Church, Rugby, to Miss KATHLEEN MARY ANSELL, daughter of Lieut.-Col. G. K. Ansell, 5th Dragoon Guards, and Mrs. Ansell.

Progress at the London Aeroplane Club

ON Tuesday of this week the machines of the London Aeroplane Club, which is the Light 'Plane Section of the Royal Aero Club, completed their first 100 hours' flying. The Club's headquarters are at the Stag Lane aerodrome of the de Havilland Aircraft Company, and the machines used are, of course, de Havilland "Moths," with A.D.C. "Cirrus" engines. Some idea of the keenness of the club members may be formed when we point out that up till now no less than 60 have received tuition, and that out of this number there are several who have had about 7 hours' flying, and who will, therefore, soon be going for their certificate. There is, of course, great competition to be the first pupil to obtain a "ticket" under the new club scheme.

As a result of the 100 hours' experience some interesting facts have come to life. That the D.H. "Moths" have been giving no trouble is not surprising, nor is the fact that the "Cirrus" engines have never even stuttered, but it is worthy of note that the total quantity of petrol purchased for the 100 hours' flying is 352 gallons, or 3·5 gallons per hour. This figure includes everything, such as waste on the ground, petrol spilled in filling, and used for cleaning, etc., so that this can now be accepted as an average figure for the consumption of a "Cirrus." The oil bought has been 16 gallons, but as the sumps have been cleaned out several times, it is considered that about 4 gallons has been more or less wasted, so that a more accurate figure to take would be 12 gallons for 100 hours, or about a pint of oil per hour. Figures such as these are extraordinarily valuable in representing actual working conditions, and it is to be hoped that other clubs will follow suit and make their results known. In that way very useful information can be collected, to the general benefit of the light 'plane movement.

Alan Cobham's Next Big Flight

"ALAN J." is planning another big flight, starting probably early in November. This time it is to be an "Empire flight to Cape Town and back." He will fly a D.H. 50 machine, and there will be about 23 stops *en route*, which will lie by way of Lyons, Pisa, Brindisi, across the Mediterranean; thence over the All-Red-Route to Cape Town.

THE ROYAL AIR FORCE

London Gazette, September 1, 1925.

General Duties Branch

The following Flight Cadets having successfully passed through the R.A.F. Cadet College, Cranwell, are granted permanent commissions as Pilot Officers, with effect from, and with seniority of, July 31:—L. W. Cannon, T. N. McEvoy, J. Eaton, W. M. C. Kennedy, B. A. C. Danbury, H. H. V. Tristem, R. Kellett, T. E. Worsley, G. P. Chamberlain, A. D. Gillmore, J. D'Arcy Keary, J. A. P. Harrison, E. G. Hordern, A. V. Hammond, J. R. Jones, F. M. V. May, R. C. Wilson, H. L. Patch, G. E. G. Lywood, B. W. Knox, T. H. Carr, C. H. G. Bremridge, J. G. D. Armour. Lt. W. Sitwell Lea, R.N., is granted a temp. commission as a Flying Officer on attachment to R.A.F. for four years. (Aug. 18). The following Pilot Officers are promoted to rank of Flying Officer:—L. W. Dickens (June 19), F. E. R. Dixon, M.C. (July 3). The following Pilot Officers on probation are confirmed in rank:—K. C. Baker, W. F. Bryanton, P. B. Chubb, K. Copperthwaite, G. W. Cripps, E. J. Ellis, T. P. F. Fagan, F. S. Homersham, D.C.M., M.C., J. A. E. Inkster, L. B. McGoverne, G. P. Mee, G. M. E. Shaw, D. C. Sherman, W. A. Shorten, V. J. Sofiano, E. T. Wiltshire (July 6), H. A. Evans-Evans, C. W. Woodbyrne (July 7), H. E. N. Burton (Aug. 6).

Flight Lt. E. L. Barrington, M.C., D.F.C., is placed on the retired list at his own request (Sept. 1); Flying Officer F. O. Burnley is transferred to Reserve, Class B. (Sept. 1); Flying Officer H. E. Y. Carroll (Lt. 8th Hussars) relinquishes his temp. commn. on return to Army duty (Aug. 1); the short service commission of Pilot Officer on probation R. C. W. Smyth is terminated on cessation of duty (Sept. 1).

Medical Branch

Flight Lt. T. P. Harpur resigns his temp. commission (Sept. 1).

Memoranda

Lt. D. N. Stewart-Saville, M.C. (Half-pay list), is granted the rank of Capt., R.A.F., on retirement from the Army; Sec. Lt. H. Hansom relinquishes his honorary commission on enlistment in the Territorial Army.

The permission granted to Capt. C. Lawrence to retain rank is withdrawn on his conviction by the Civil Power (July 1).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Squadron Leaders: A. S. C. S. MacLaren, O.B.E., M.C., D.F.C., A.F.C., to R.A.F. Depot, Uxbridge, 21.9.25. C. N. Lowe, M.C., D.F.C., to Headquarters Special Reserve and Auxiliary Air Force, 7.9.25. G. E. Livock, D.F.C., to Marine Aircraft Experimental Estab., Felixstowe, 14.9.25. C. E. H. James, M.C., to Station Commandant, Basrah.

Flight Lieutenants: A. McR. Moffatt, to Headquarters, Coastal Area, 31.8.25. John Potter to Inland Area Aircraft Depot, Henlow, 27.8.25. C. D. Fuller to Sch. of Tech. Training (Men), Manston, 2.9.25. K. H. Riversdale-Elliot to No. 1 Group Headquarters, Kidbrooke. 27.9.25. Frank Wright to Air Ministry. 8.10.25.

Flying Officers: A. A. C. Hyde, to No. 9 Sq., Manston, 3.9.25. B. M. T. S. Leete to R.A.F. Depot, Uxbridge, on transfer to Home Estab., 16.8.25. R. L. McK. Barbour, D.F.C., to No. 22 Sq., Martlesham Heath, 7.9.25. C. V. Lacey, A.F.C., to Inland Area Aircraft Depot, Henlow, 27.8.25. G. A. F. Bucknall to No. 2 Flying Training Sch., Digby, 4.9.25. L. A. W. Deane to Inland Area Aircraft Depot, Henlow, 7.9.25. R. E. M. Milne, to No. 28 Sq., India, 11.8.25. O. K. Stirling Webb, to No. 1 Sch. of Tech. Training (Boys) Halton, 7.9.25. J. E. Hewitt, Lieut., R.A.N., to Sch. of Naval Co-operation, Lee-on-Solent. 7.8.25. F. E. Bond to R.A.F. Base, Gosport. 14.9.25. J. S. Nichol to No. 11 Squadron, Netheravon. 27.9.25. A. G. S. Tuke to No. 1 Stores Depot Kidbrooke on transfer to Home Establishment. 27.7.25. A. R. Buchanan to R.A.F. Depot, Uxbridge. 2.9.25.

Pilot Officers: H. H. V. Tristem, to No. 207 Sq., Eastchurch, instead of No. 3 Sq., Upavon, as previously notified, 31.7.25. J. G. D. Armour, to No. 3 Sq., Upavon, instead of No. 207 Sq., Eastchurch, as previously notified, 31.7.25.

Stores Branch.

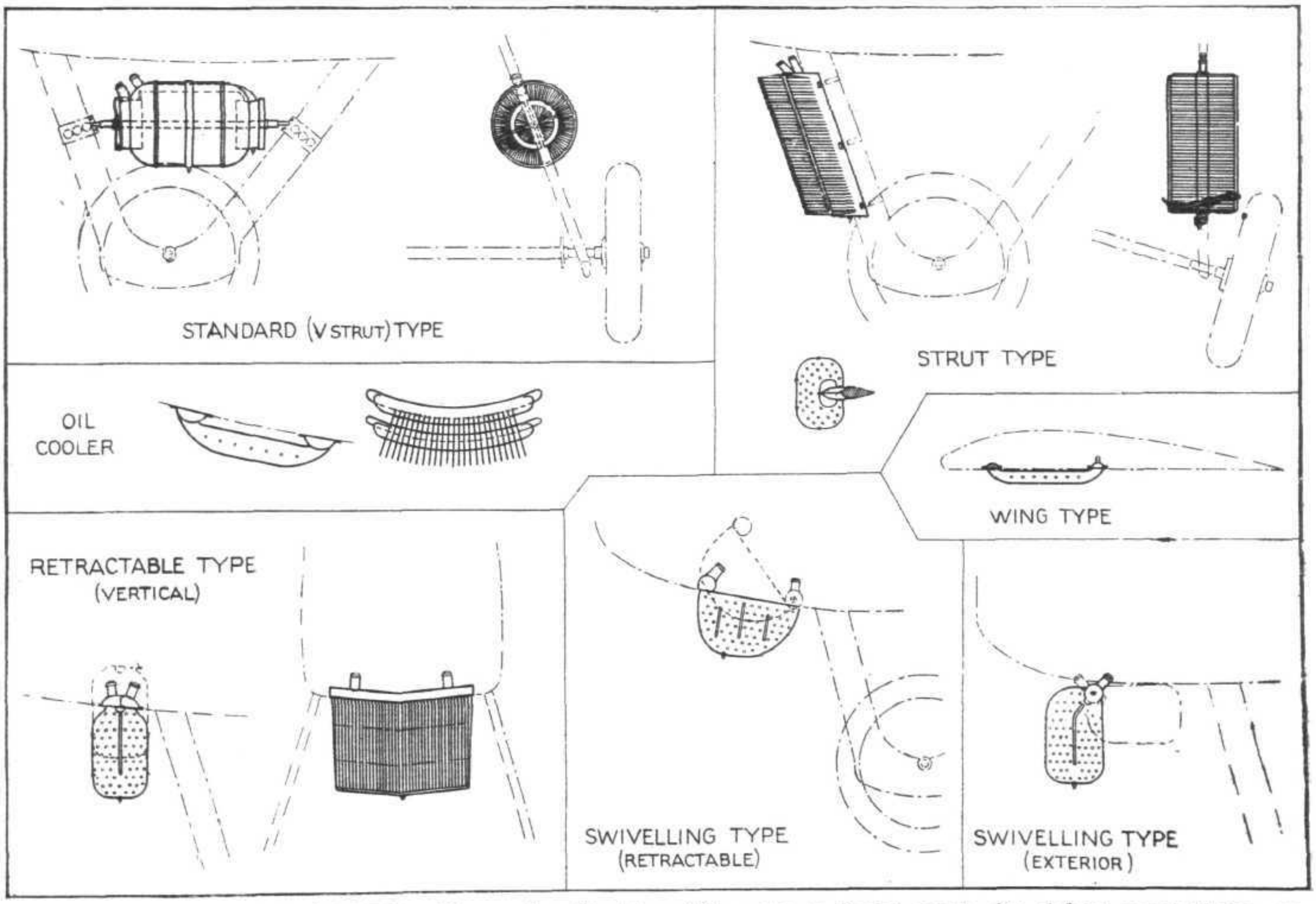
Flying Officer: Horatio Sleigh to No. 602 Squadron, Glasgow. 15.9.25.

Accountant Branch.

Flight Lieutenant F. O. Hall, to No. 2 Armoured Car Coy., Palestine, 27.8.25.
Flying Officer: W. J. Heneghan to No. 2 Flying Training School, Digby. 11.9.25.

Medical Branch.

Flight Lieutenant T. R. S. Thompson, M.B., to Headquarters, Coastal Area, 3.9.25.



LAMBLIN RADIATOR TYPES: Since the first Lamblin aero-radiator made its debut some three or four years ago, it has made rapid progress both as regards popularity and improvement in design. The above diagrams show some of the various types of this successful French component. All more or less follow the same principle—a series of thin, flat, air-spaced water compartments presenting a maximum of cooling surface, suitably connected to inlet and outlet collectors. Our diagrams are, we think, self-explanatory.

WEMBLEY TORCHLIGHT TATTOO

As the Tattoo is undoubtedly the "hit" of Wembley, so is the display given by the R.A.F. in the Tattoo the "hit" of the Tattoo itself. There is every possibility of the Tattoo being continued throughout the rest of the Wembley season, so we take this opportunity of urging those of our readers who can possibly do so to go and see this grand Naval, Military and Air Force Tattoo. From start to finish the Tattoo is without doubt the finest display that has ever been staged—it is thrilling, amusing, musical, artistic, and at the same time decidedly impressive. We do not propose to describe the Tattoo here. In the first place it is difficult to put into words the impressions left behind after witnessing this splendid performance, and secondly, if one could, it would spoil the effect for those who have yet to see it. We must say, however, that the second display given by the 400 R.A.F. recruits—most of them only a "few months old"—where they perform all manner of beautiful evolutions in complete darkness, with only shimmering red and white lanterns and their lusty voices singing snatches of popular airs to indicate their presence, is one of the most eerie and fascinating spectacles imaginable. However, you MUST go and see it for yourself. Well done, R.A.F.!

St. Raphaël Meeting Won by Schreck F.B.A.

THE competition for commercial seaplanes, which has been going on between St. Raphaël on the French Riviera, and Ajaccio, Corsica, has now concluded, and the winner of first place is Paumier, who was flying a Schreck F.B.A. flying boat, fitted with 450 h.p. Hispano-Suiza engine. Second place was secured by Darquet, who also flew a Schreck F.B.A., but this machine was equipped with a 450 h.p. Lorraine engine. But for the regrettable disappearance, and presumed loss, of a third F.B.A., this firm has thus done extremely well, and in this connection it is of interest to note that originally the company was formed by Lieut. Conneau, who flew in and won the Circuit of Britain under the name Beaumont, the title of the firm being the Franco-British Aviation Company.

With reference to the competition itself, there is little to tell. The machines were not of types which would be regarded in this country as "commercial," and even in France certain aviation journals have criticised the competition on the score that it has not produced any seaplanes which could be regarded as *hydravions de transport*. For this the French constructors are not, of course, to blame, but rather those responsible for drawing up the rules. The twin-engined C.A.M.S., which once won this competition, took part again this year, but had to abandon on the last circuit.

Breguets for America

Two Breguet 19 A2 biplanes have been entered for the forthcoming race meeting at Mineola, where they will take part in the "Liberty Engine Builders Race." One machine is fitted with a 450 h.p. Lorraine engine, and the other with a 480 h.p. Renault.

R.A.F. Flying Accident

THE Air Ministry regret to announce that as a result of an accident at Lee-on-Solent, Hants, to a Blackburn machine of R.A.F. Base, Gosport, on September 4, Flying Officer (Hon. Flight Lieutenant) Geoffrey Ashton Cavis-Brown, the pilot and sole occupant of the aircraft, was dangerously injured and died shortly afterwards.

Russian Flight to Japan

OF the six Russian aeroplanes of the "Dobrolet" (Soviet Volunteer Air Fleet Co.), which left Moscow on June 10 for Peking, two continued their flight to Japan, where they arrived on September 1. One of the machines was forced to land at Shimoy, owing to fog, and this being a "prohibited area" the machine was detained by the military authorities.

Fire at Biggin Hill Aerodrome

A FIRE broke out in the early hours of the morning of September 1 at the R.A.F. Aerodrome, Biggin Hill, and in spite of the efforts of officers and other ranks, together with the Bromley fire brigade, the officers' mess was partially destroyed and other damage done. Fortunately, the hangars were some distance away, and no harm to the machines resulted.

Vickers' "Vanguard" Air Liner Tested

THE Vickers' "Vanguard" air liner (two 650 h.p. Rolls-Royce "Condors"), which is shortly to be put into service by Imperial Airways, recently passed its tests at Martlesham Heath. It is claimed to be the largest passenger-carrying aeroplane in the world, having seating accommodation for 22 people.

PUBLICATIONS RECEIVED.

Bulletin Technique de la Société Francaise Hispano-Suiza. No. 2. July-August, 1925. Société Française "Hispano-Suiza," Rue de Capitaine-Guynemer, Bois-Colombes, Seine, France.

Hispano-Suiza Motors in 1924. Société Française "Hispano-Suiza," Rue de Capitaine-Guynemer, Bois-Colombes, Seine, France.

Report of the Aeronautical Research Committee for the Year 1924-25. H.M. Stationery Office, Kingsway, London, W.C.2. Price 1s. 6d. net.

Aeronautical Research Committee, Reports and Memoranda: No. 956 (*Ae.* 174).—The Airflow Round a Body as Affecting Airscrew Performance. By C. N. H. Lock, H. Bateman, and H. C. H. Townend. January, 1925. Price 1s. 3d. net. No. 969 (Ae. 185). A note on the Katzmayr Effect, That is, The Effect on the Characteristics of an Aerofoil Produced by an Oscillating Airstream. By W. L. Cowley. March, 1925. Price 6d. net. H. M. Stationery Office, Kingsway, London, W.C.2.

Aeronautical Research Committee, Reports and Memoranda. No. 995. (Ae. 174.) The Measurement of Airflow Round an Airscrew. By C. N. H. Lock and H. Bateman. November, 1924. Price 1*s.* net. *No.* 968. (Ae. 184.) Full-scale Tests of a New Slot-and-Aileron Lateral Control. By H. L. Stevens. March, 1925. Price 3*d.* net. *No.* 971. (Ae. 186.) An Experimental Investigation into the Properties of Certain Framed Structures having Redundant Bracing Members. Report No. 2. By Prof. A. J. Sutton Pippard and G. H. W. Clifford. May, 1925. Price 3*d.* net. *No.* 972. (Ae. 187.) Full-scale Tests of a Bristol Fighter with Increased Rudder Control. By H. L. Stevens. April, 1925. Price 3*d.* net. H.M. Stationery Office, Kingsway, London, W.C. 2.

Notiziario Tecnico No. 1. *July,* 1925. Commissariato dell' Aeronautica. Dir. Sup. del Genio e delle Costruzioni Aeronautiche, Rome.

Aeronautical Research Committee, Reports and Memoranda: No. 864 (M. 22).—The Effect of Keyways upon the Strength and Stiffness of Shafts Subjected to Torsional Stresses. By H. J. Gough. April, 1925. Price 1*s.* 3*d.* net. H.M. Stationery Office, Kingsway, London, W.C.

Education, Research and Standardisation. By Sir J. Dewrance. Autumn Lecture, 1925. The Institute of Metals, 36, Victoria Street, Westminster, London, S.W. 1.

Poppy Day Report, 1924. *Earl Haig's. Appeal.* The British Legion, 145, Piccadilly, London, W. 1.

National Institute for the Blind: *Annual Report,* 1924-25. The National Institute for the Blind, 224-228, Great Portland Street, London, W.1.

AERONAUTICAL PATENT SPECIFICATIONS

Abbreviations: Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.

APPLIED FOR IN 1924
Published September 10, 1925

17,497. R. E. BOZON. Pilotless aircraft for use in war. (238,352.)
17,768. P. I. V. RIPPON. Fire-extinguisher for aeroplanes. (238,356.)
22,362. S. E. SAUNDERS. Hulls for flying-boats, etc. (238,395.)
22,996. SIEMENS-SCHUCKERTWERKE GES. Rotors for asynchronous motors. (222,861.)

APPLIED FOR IN 1925
Published September 10, 1925

8,978. S. A. Reed. Air propellers. (238,486.)

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